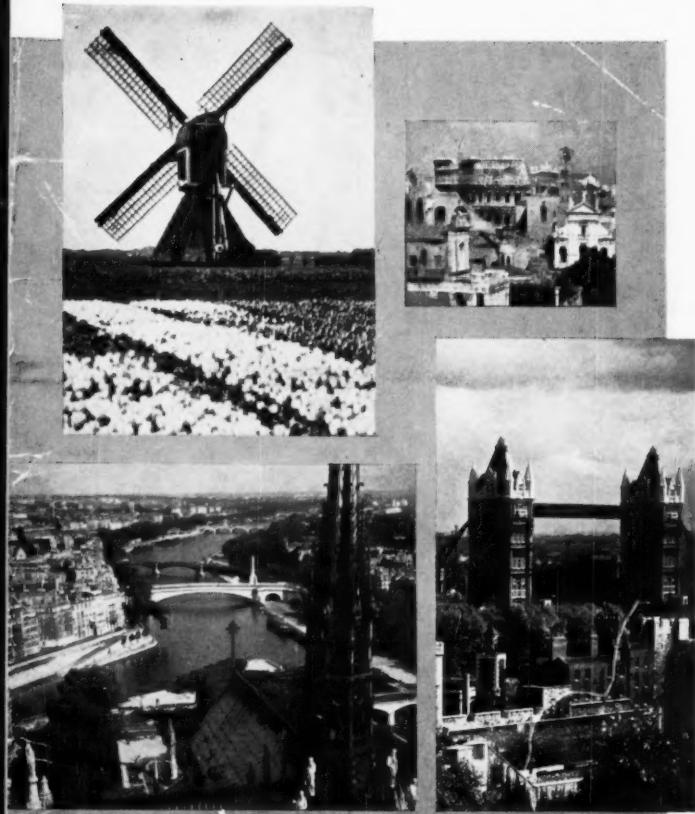


Chemical Week



JUNE 18, 1960

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Hercules eyes Beaunit;
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Philadelphia: chemi-
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OPPORTUNITIES **P. 133**



Revamped market for
auto chemicals rides in
with new models p. 115

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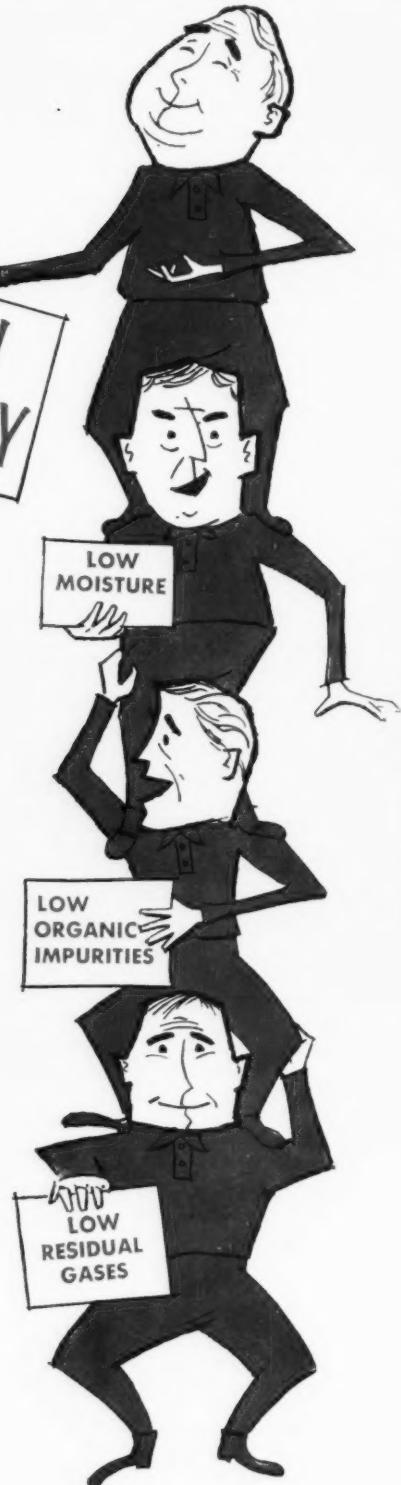
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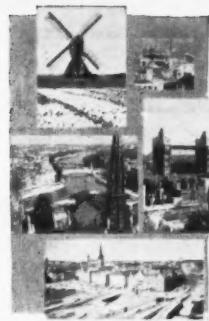
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ON THE COVER: The five countries shown on the cover are key stops for any management man checking on Europe's chemical industry. Clockwise, from top left: Holland; Rome, Italy; London, England; Stockholm, Sweden; Paris, France. Pictures from Pan American; Netherlands Tourist Office.



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Our Uncoordinated Coordination

THE CURRENT CONTROVERSY over whether to give the President's Science Advisory Committee permanent status is confusing to many people—as are most efforts to put the executive branch's crowded and jostling bureaucracy into order. The problem, according to the oversimplification of the Jackson subcommittee and the White House, is one of Presidential prerogative: Should the new 1961 President be able to arrange his own advisory system, or shall he simply inherit Eisenhower's?

Specifically, the proposal is to give both the office of Special Assistant to the President for Science and Technology and the President's Science Advisory Committee legislative status. Since the function of both is advisory and nobody or no bit of legislation can make a President listen to advice if he doesn't want to (every President has his own version of the "kitchen cabinet"), a decision either way might seem to be academic.

We would tend to agree—but for one important point: any legislative acceptance of the present setup would help to freeze the status quo in government management of science, and we think that would be intolerable.

The government has alternately drifted and tinkered with the advancement of science into its affairs, and has thereby accumulated a miscellaneous assortment of machinery for handling it—more ressemblant of a tinker's workshop than a modern laboratory.

Among others—many others—we have the Office of Naval Research, the Food & Drug Administration, the National Bureau of Standards, the National Aeronautics and Space Administration, the Dept. of Agriculture, the Bureau of Mines, the National Institutes of Health—and, of course, anybody in the Pentagon.

There is, as anyone acquainted with the work of any half-dozen of these organizations knows, a great deal of overlap, lack of communication and, in general, lack of coordination in governmental scientific inquiries. The right hand doesn't know what the left hand is doing. The government has reacted in its time-honored way—breeding confusion out of simplicity.

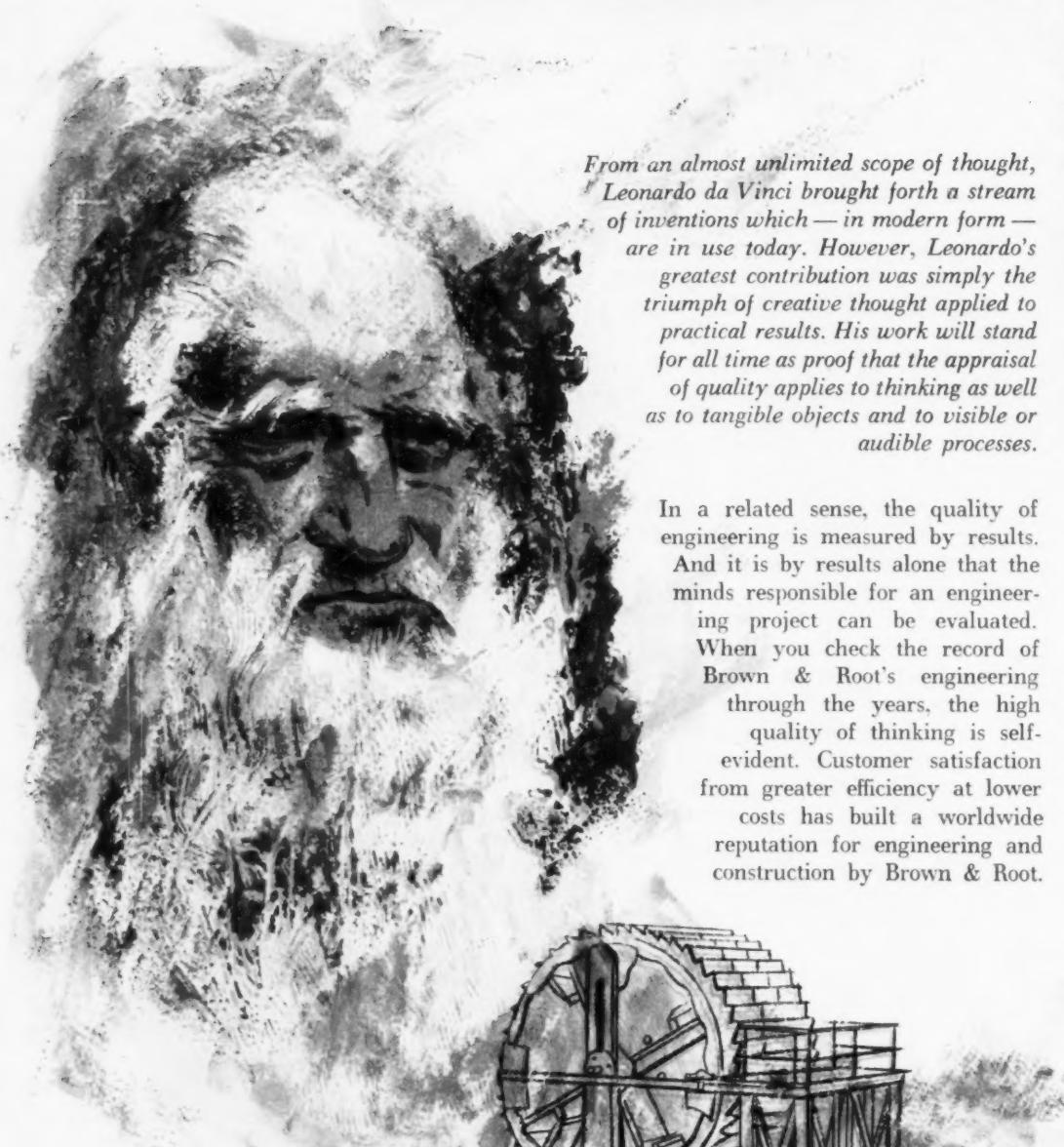
The government has similarly dealt with the mass of overlapping agencies, committees and departments concerned with science by adding committee after committee. And realizing that this might not work, it added an extra advisor to straighten out the committees. When it really gets down to business, it hires a private research company.

Possibly the greatest lesson the government can learn from these private companies doesn't appear in their factual reports. What the government needs to know is how the private company was organized to get these facts.

And that is easy enough to learn. In industry scientific problems are attacked by project groups: teams of working researchers who know what they are dealing with, and deal with it. And there is one key to the smooth operation of various teams—their activities are co-ordinated by one over-all management group. Coordination is or it isn't. It isn't if you have a Washington telephone directory full of uncoordinated coordinating groups.

THE QUALITY OF

THINKING



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BEHIND THE NEWS

Putting Spotlight On Global Business

If you look at the masthead on p. 5, you'll find a new department: Foreign. In a sense, this is formal recognition of a trend you have probably noticed during the past two years or so. CHEMICAL WEEK's international coverage has been steadily increasing as our industry has, with dramatic speed, become increasingly internationalized.

Only a dozen years ago the chemical industry was insular in its thinking, was more concerned with blocking foreign competition in home markets than with meeting that competition head-on in the marketplaces of the world.

The situation has changed drastically. Competition from abroad has stiffened as European and Japanese producers have come on stream with modern, large-scale plants, pouring products into "third markets" as well as into their own countries. And the Communist chemical buildup presents a new threat.

World markets are changing. Regionalism is creating new trade patterns, wider markets. The underdeveloped countries are building their own industries.

U.S. chemical producers have had to overhaul their international organizations and launch investment programs abroad in order to hold on to their world markets and share in industrial growth that often exceeds the growth rate in the U.S.

In short, the U.S. chemical industry has gone international. What happens overseas is now of direct importance to producers in the U.S.

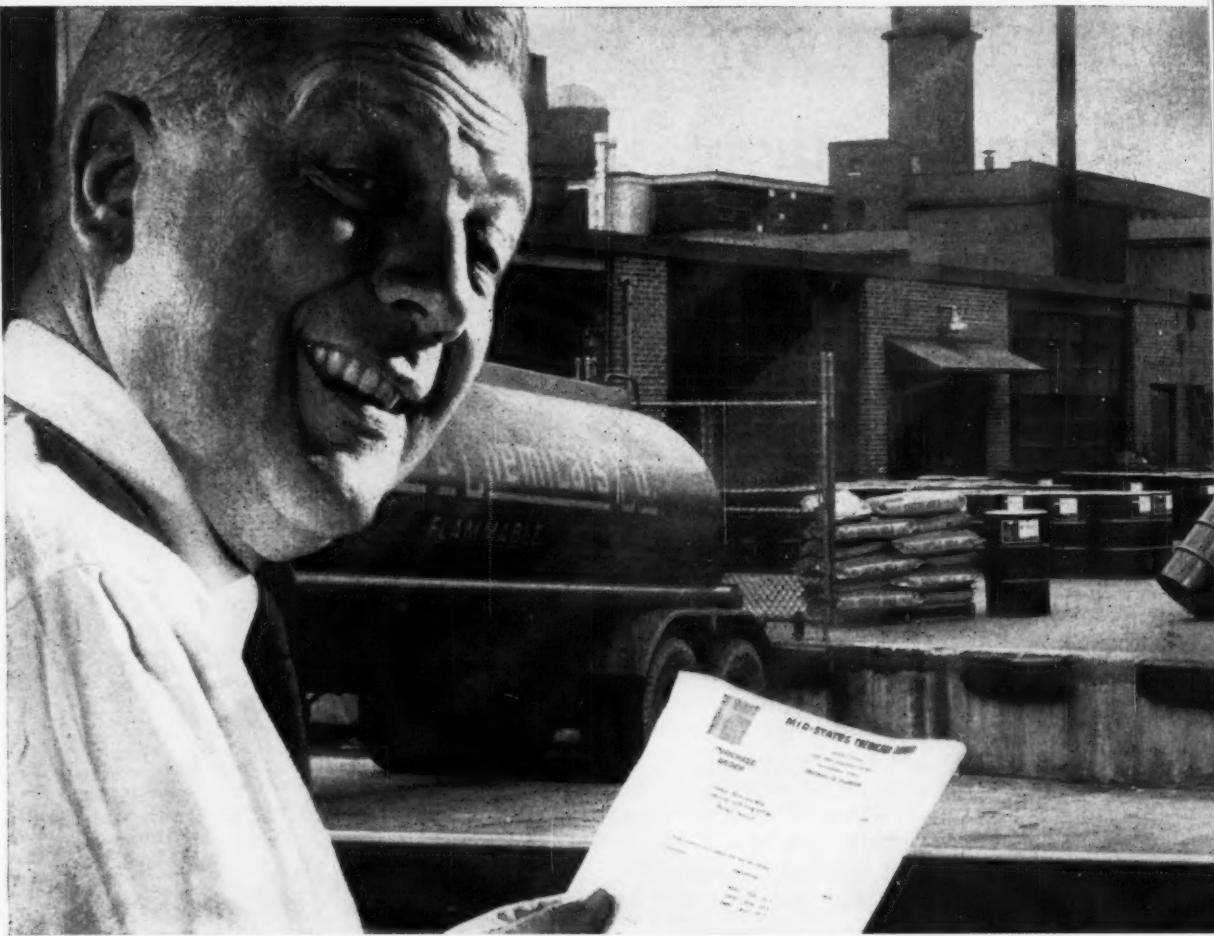
CHEMICAL WEEK is unique among chemical newsmagazines in its facilities for covering the international scene. As a McGraw-Hill publication it shares the services of the company's 10 foreign news bureaus, which employ 23 full-time editors. Additionally, it can call on 71 McGraw-Hill correspondents outside the U.S.

As Foreign Editor, Bruce Bendow will be working closely with our bureaus and correspondents throughout the world. Bendow is a graduate of New York University, and since joining the CHEMICAL WEEK staff almost three years ago he has been preparing himself for his new responsibilities by pursuing graduate studies in economics. As an assistant Business News Editor, he specialized in foreign developments. Last summer, for example, he accompanied the U.S.S.R.'s First Deputy Premier Frol Koslov on his tour of the U.S. (CW, July 18, '59, p. 12). Now such international coverage can be put on a coordinated, consistent basis. Bendow will spend all his time keeping track not only of significant industry developments overseas, but also of economic and political developments that affect overseas interests of the international-minded U.S. chemical industry.

A sampling of recent CW international stories.



Russia's Balshakov (left), Foreign Editor Bendow.



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LETTERS

Claude Ammonia Process

TO THE EDITOR: . . . [Re] the chart you published (April 9, p. 65) concerning the ammonia synthesis processes.

You mention separately L'Air Liquide and the Claude processes. In fact, it is one process; Georges Claude started it. It has been perfected by the two associated French companies, Societe Chimique de la Grande Paroisse and L'Air Liquide. Furthermore the total capacity of the corresponding plants in the States is 500,000 tons/year.

May I add also a few words about the pressures used in the various processes. Certainly, the tendency is toward middle-pressure systems (4,000 to 8,000 psi.). It is just a matter of cost—not synthesis cost, but overall cost—from raw material to ammonia. With purer synthesis gases as prepared with liquid nitrogen wash, there is no reason to use a 15,000-psi. system, as Claude did when he started in 1921. With less pure gases, less costly to prepare, the presence of inerts necessitates a boost in pressure.

PIERRE GUILLAUMERON
L'Air Liquide
Paris

Shale Oil Advocate

TO THE EDITOR: Your Energy report (May 14) contained a brief quotation attributed to our firm. We would appreciate being quoted further.

You state that "it is not likely that an oil shale industry will be established in the foreseeable future because imported crudes have kept the price of conventional (or domestic) crudes from rising."

It was further pointed out that the NPC study of 1951 showed that gasoline made from shale oil could have been sold in California for just a few cents a gallon above the then going price for conventional gasoline, but that to arrive at a reasonable price for shale gasoline today, the price would have to be increased by 30% because of inflation. This conclusion is incorrect. Improvements in oil shale technology during the past decade have more than erased this increase. On the other hand, the cost

of finding domestic petroleum has increased significantly, as your article correctly points out. Shale oil now not only competes with domestic crude but also is less costly.

Neither shale oil nor domestic crude can compete with foreign crudes during the present world oil glut. However, current restrictions on oil imports will not be relaxed, since domestic producers cannot be allowed to wither on the vine.

One day we shall be confronted with world gluts in steel, automobiles, textiles, electronics, books, bicycle pumps, *ad infinitum*. Do we then curtail production in these fields for the foreseeable future because foreign items are cheaper? Obviously not. The 16% limitation on crude imports is only another instance illustrating that we are accepting the cold facts of this painful situation despite outcries of small vociferous elements who stand to profit over the short term by importation of cheap commodities.

RUSSELL J. CAMERON
President
Cameron and Jones, Inc.
Denver

We did not imply that oil imports would be increased to a point where domestic producers will be allowed to "wither on the vine." What we said was that imports would serve to keep domestic prices for crude down and thereby reduce the incentive for starting a shale oil industry. As Russell J. Cameron himself testified:* "It is probable that a change in market conditions must take place before shale oil will be produced in quantity."—ED.

Third but Largest

TO THE EDITOR: Your item in Business Newsletter (May 21, p. 18) concerning Monsanto's proposed West Coast phthalate ester plant was very interesting but slightly in error, viz., "the first for the area."

Allied Chemical acquired among other things an esterifying unit for manufacture of phthalates with pur-

* Hearings before the Subcommittee on Automation and Energy Reserves of the Joint Economic Committee Congress of the U.S., Oct. 12-16, '59.

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LETTERS

chase of Specialty Resins Co. (Lynwood, Calif.) (*CW*, May 14, p. 36). In addition to Specialty Resins, Nopco Chemical Co. produces phthalate esters on the West Coast at Richmond, Calif. Therefore Monsanto will have the third phthalate ester facility on the West Coast in mid-'61, not the first.

T. D. DONOHOE
Plastics and Coal Chemicals
Division
Allied Chemical Corp.
Los Angeles

We should have said the first "major" plant. Monsanto's will be considerably larger than the two existing units.—ED.

Chart Is Right

TO THE EDITOR: In reporting the results of the CSMA annual aerosol product survey (*May 28*, p. 37) you indicate that hair sprays showed a decline of 20 million units from '58 to '59. However, in your chart you correctly report the production figures, but you will find that the difference between '58 and '59 is 12.9 million units rather than 20 million.

E. E. HUSTED
Chairman
Product Survey Committee
Chemical Specialties
Manufacturers Assn.
New York

Bidding on Plants

TO THE EDITOR: [Re] the article (*May 7*, p. 40) "Organized Bids: Key to Cutting New-Plant Costs."

You have published a thought-provoking report on a serious current problem in the processing industries, and I wish to add my congratulations to the many you must be receiving. . . .

R. L. INGRAM
Bechtel Corp.
San Francisco

CW welcomes expressions of opinion from readers. The only requirements: that they be pertinent, as brief as possible.

Address all correspondence to: H. C. E. Johnson, Chemical Week, 330 W. 42nd St., New York 36, N.Y.

MEETINGS

American Institute of Chemical Engineering, joint meeting with I.M.I.Q., Del Prado Hotel, Mexico City, Mex., June 19-22.

Gordon Research Conferences at Colby Junior College, New London, N.H.—June 20-24, elastomers: structure and properties; June 27-July 1, nuclear chemistry; July 4-8, polymers; July 11-15, textiles; July 18-22, corrosion; July 25-29, separation and purification; Aug. 1-5, instrumentation; Aug. 8-12, food and nutrition; Aug. 15-19, medicinal chemistry; Aug. 22-26, catalysis; Aug. 29-Sept. 2, cancer.

Gordon Research Conferences at New Hampton School, New Hampton, N.H.—June 20-24, information processing for critical tables of scientific data; June 27-July 1, proteins and nucleic acids; July 4-8, chemistry and physics of isotopes; July 11-15, statistics in chemistry and chemical engineering; July 18-22, radiation chemistry; July 25-29, organic reactions and processes; Aug. 1-5, steroids and other natural products; Aug. 8-12, organic coatings; Aug. 15-19, analytical chemistry; Aug. 22-26, inorganic chemistry; Aug. 29-Sept. 2, adhesion.

Gordon Research Conferences at Kimball Union Academy, Meriden, N.H.—June 20-24, cell structure and metabolism secretion; June 27-July 1, physical metallurgy: relation of structure and properties; July 4-8, chemistry at interfaces; July 11-15, chemistry, physiology and structure of bones and teeth; July 18-22, high-pressure research; July 25-29, chemistry and metallurgy of semiconductors; Aug. 1-5, solid-state studies in ceramics; Aug. 8-12, chemistry and physics of solids: point defects; Aug. 15-19, toxicology and safety evaluations; Aug. 22-26, infrared spectroscopy; Aug. 29-Sept. 2, high-temperature chemistry: kinetics of vaporization and condensation processes.

Parenteral Drug Assn., Edgewater Beach Hotel, Chicago, June 24.

Columbia University Industrial Research Conference, Arden House, Harriman, N.Y., Aug. 7-13.

Heat Transfer Conference and Exhibit, Statler-Hilton Hotel, Buffalo, N.Y., Aug. 15-17.

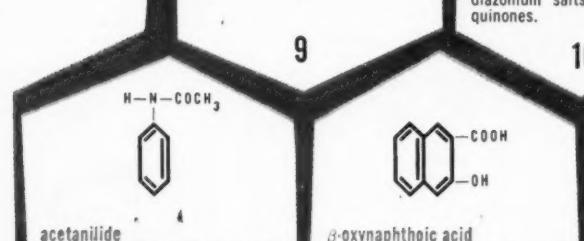
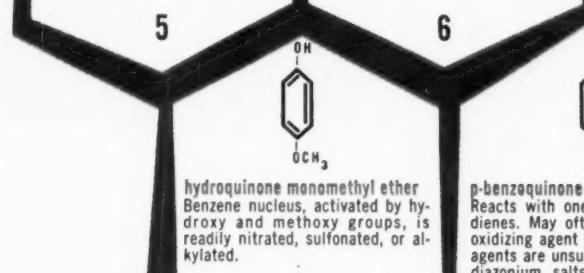
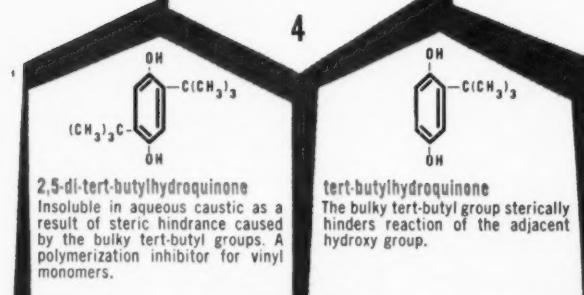
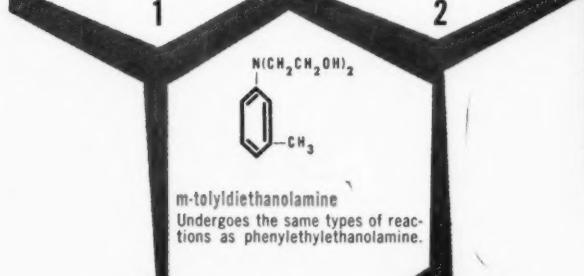
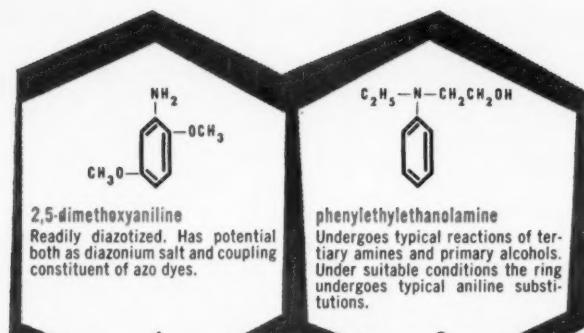
Cryogenic Engineering Conference, University of Colorado, Boulder, Colo., Aug. 22-24.

Technical Assn. of the Pulp and Paper Industry, alkaline pulping conference, Multnomah Hotel, Portland, Ore., Aug. 22-24.

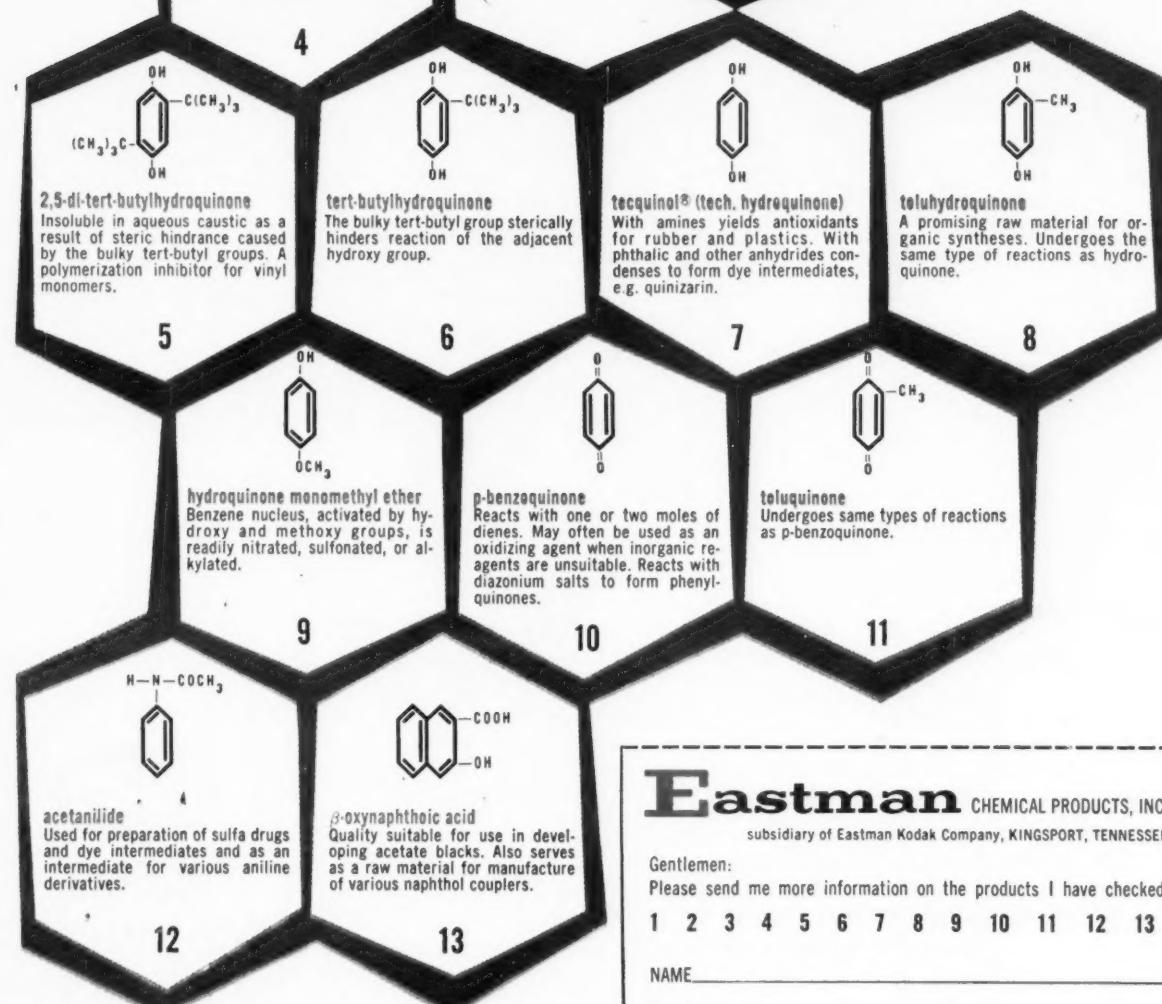
Joint Automatic Control Conference, Massachusetts Institute of Technology, Cambridge, Mass., Sept. 7-9.

American Chemical Society, National meeting, New York, N.Y., Sept. 11-16.

Society of Plastic Engineers, conference, theme: plastics in business machinery; Binghamton, N.Y., Sept. 22.



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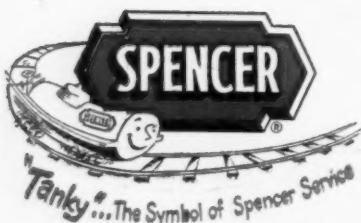
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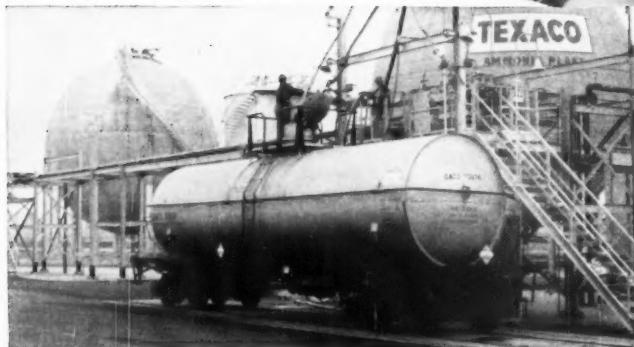
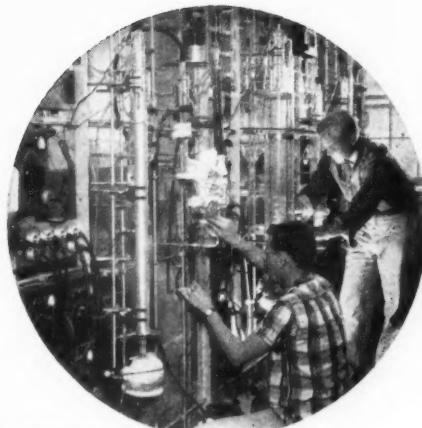
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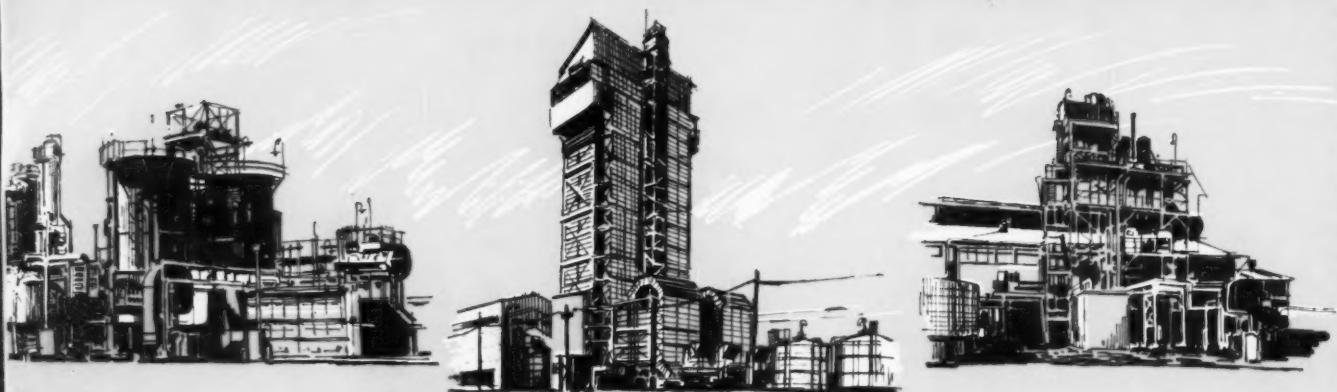
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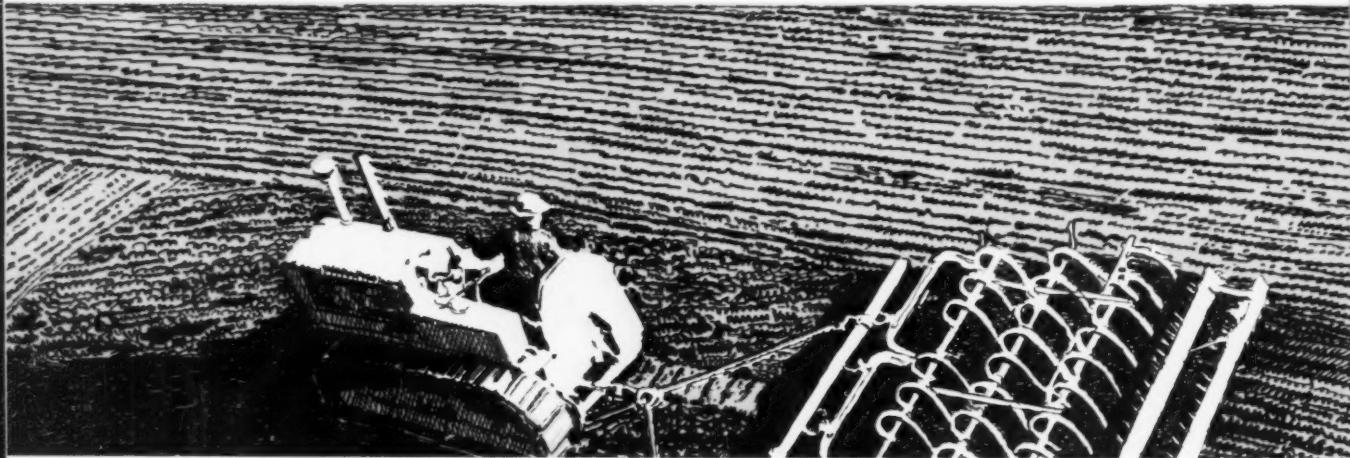
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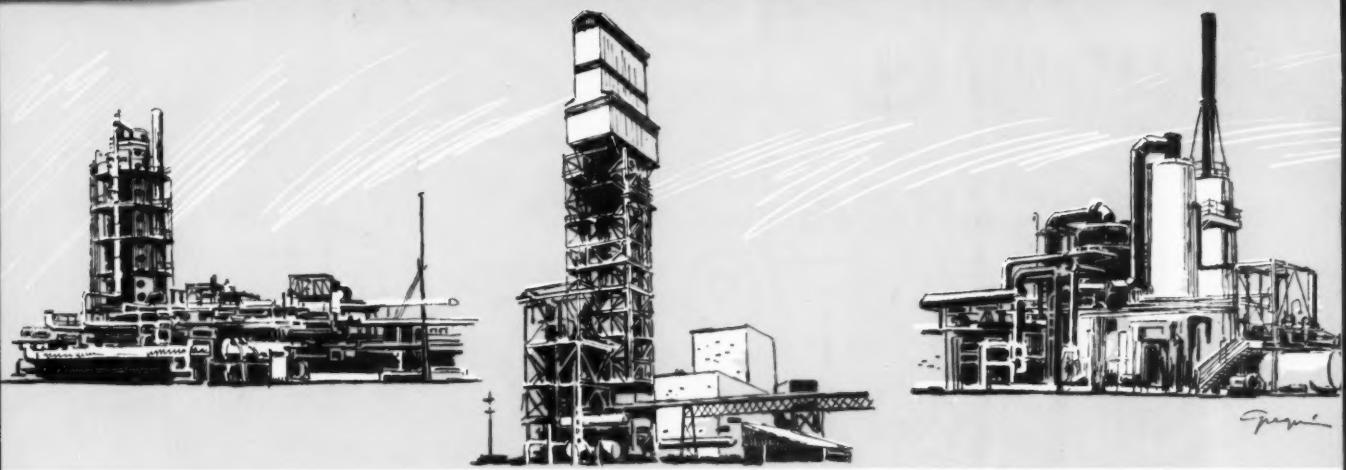


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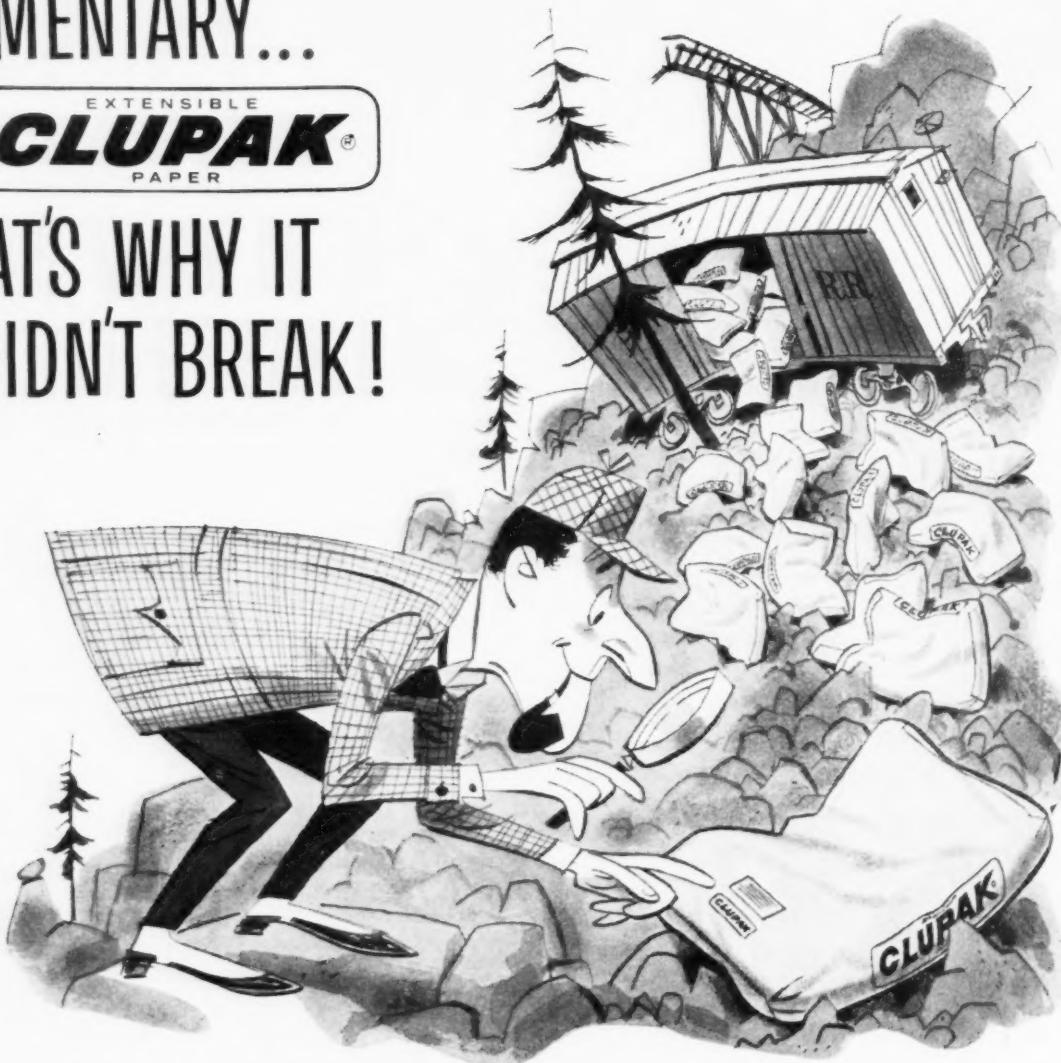


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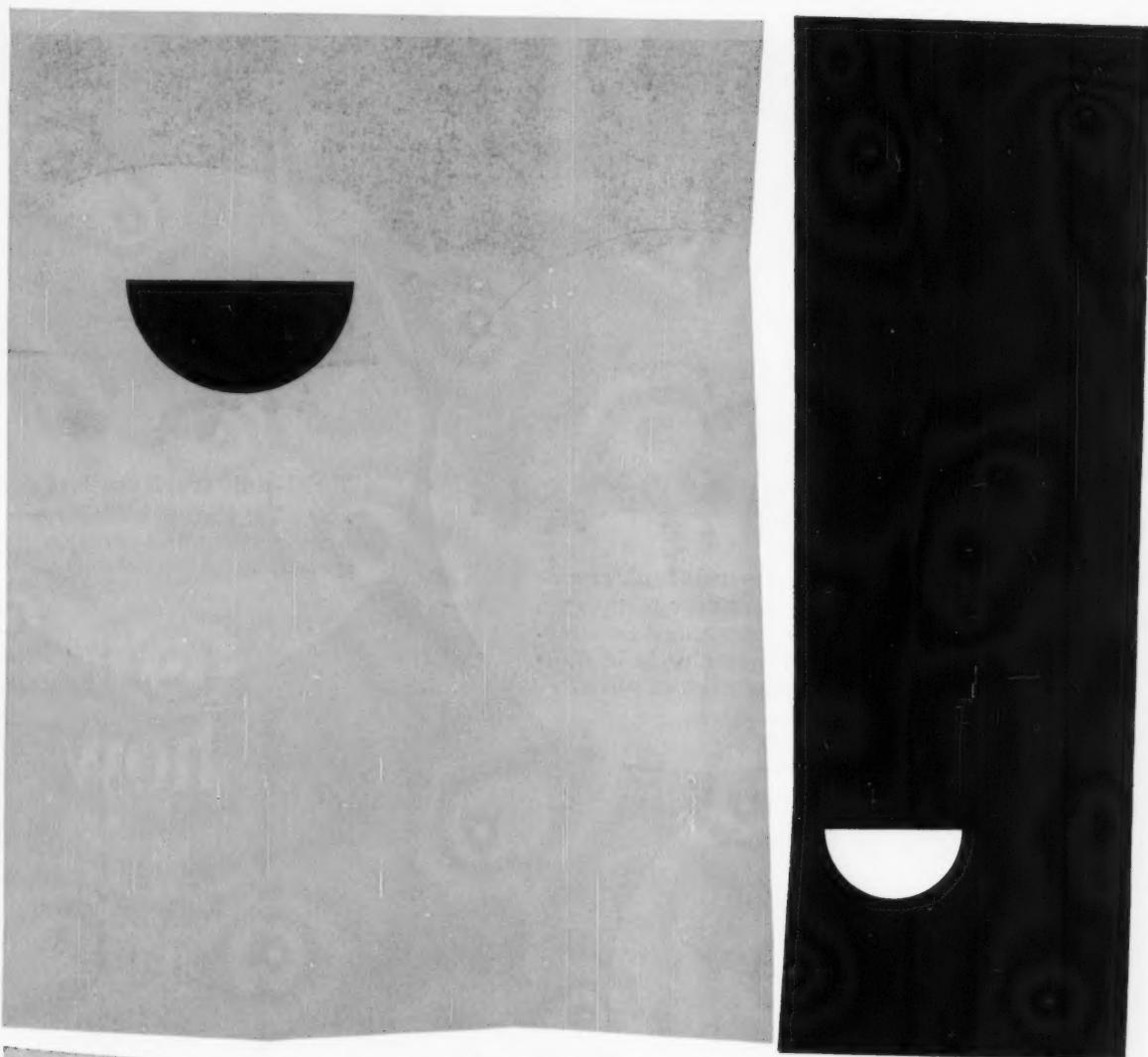
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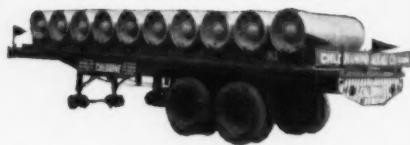
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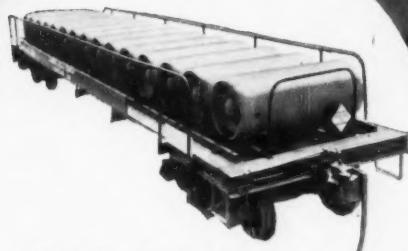
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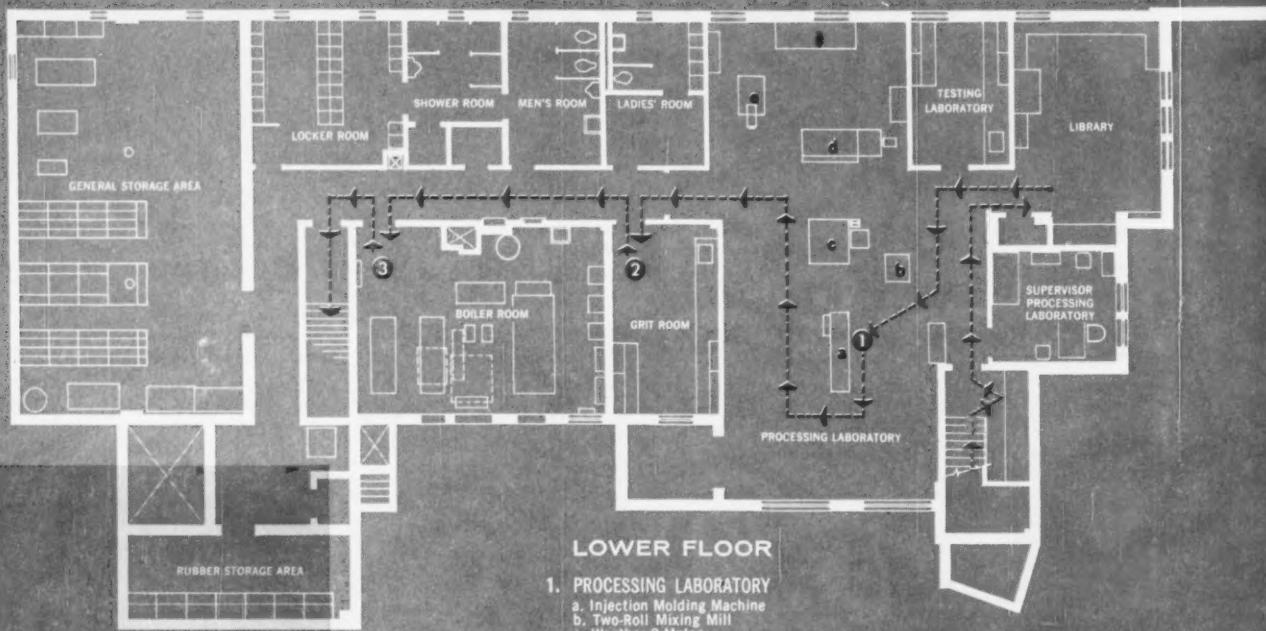
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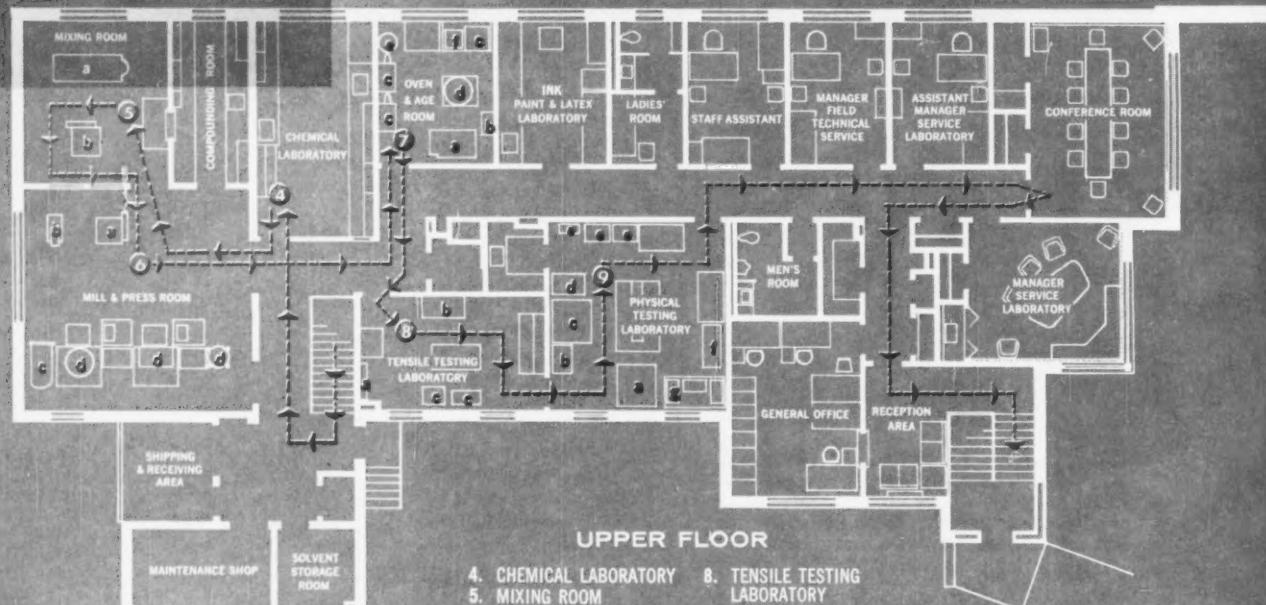
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410 PARK AVENUE, NEW YORK 22, N. Y.

A Subsidiary of United Carbon Company
AKRON CHICAGO LOS ANGELES
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In Canada: CANADIAN INDUSTRIES LIMITED





SERVICE LABORATORY AKRON



a. Goodyear-Healey Rebound Machine

b. CRE Tester

c. Constant Rate of Extension Testers

a. Goodyear Angle Abrader

b. Goodrich Flexometer

c. Firestone Flexometer

d. Extrusion Plastometer

e. Mooney Shearing Disc Viscometer

f. De Mattia Flexing Machine

g. Ross Flexing Machine

news briefs...

ON THE CREATIVE USE OF M & C PROCESS MATERIALS

*Plastics molder boosts sports car body strength with ASP® filler



†Comparison of Body Specifications with Random Test Sample of Molded Laminate Loaded 29% with ASP 403.

	Specification	Sample
Reverse Impact, in.†	8	10
Tensile, psi	15,000	19,200
Izod Impact	not specified	25.8
Flexural Strength, psi (room temperature)	25,000	40,100
Wet Flexural Strength, % retention	70	88.2
Flexural Modulus (10 sec.)		
Room temperature	1.30	1.77
Wet, % retention	70	79.2
180 F.	0.50	0.75

Sample is normal formulation of 9 to 1 ratio of resilient resin to styrene, 0.8% BPO catalyst, and ASP 403 filler loading of 29 weight % of the resin-filler total. Molded at 235 F. with 3-minute press time cycle.

†Reverse Impact test simulates the effect of stones striking the under-side of fenders or panels, and measures the ability of the smooth outer surface to resist this road abuse. A 12-in. square by 0.10-in. thick plastic laminated panel is placed on a 5-in. diameter ring, with a 30-mil veil mat between. A 1½-lb., 1½-in. diameter steel ball is dropped on the center of the panel from varying heights, red dye is wiped on the lower side of the panel and then wiped off. Any minute surface fractures are penetrated by the dye and made visible as a mark or star. The specification and sample test values indicate the maximum drop distance for the ball without causing visible surface failure.

Molded Fiber Glass Body Co., maker of the body for the prominent sports car pictured, found ASP-filled moldings consistently met and exceeded customer specifications...standardized on M & C's aluminum silicate pigments for filling parts requiring high physicals.†

Plastics molders like the quality-boost and economy of high-loading ASP fillers. In addition to building physicals, these kaolin-derived M & C process materials make smoother and denser surfaces, eliminate crazing, lower peak temperatures from the exotherm and thus reduce shrinkage.

What will the ASP's do for your moldings? This is a *starred* item...check the coupon as the first step to finding out.



Minerals & Chemicals Corporation

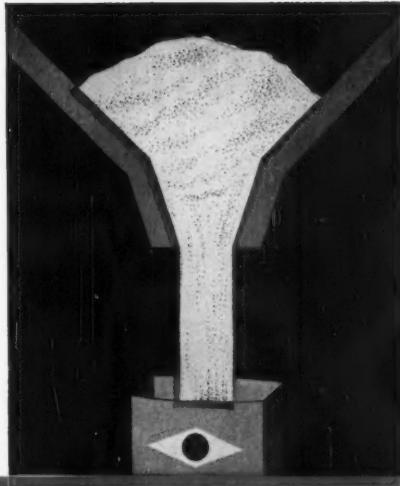
7946 Essex Turnpike, Menlo Park, New Jersey

Leaders in creative use of non-metallic minerals

Export Department: Room 150, Garden State Parkway, Menlo Park, N.J. (Cable Address: "MICOR")

***Trouble with caking? not with low-cost, easy-to-use Attacote® on the job**

Solids that cake up or agglomerate during manufacture, storage, or transit—whether due to their own natural stickiness (hygroscopicity), severe environment, or handling—will be kept free-flowing with Attacote. Attacote is an attapulgite product of fine particle size, averaging 8 microns—its light, neutral color blends well. Its virtual inertness insures compatibility. Attacote is low in cost . . . uniform in quality . . . easy to use. A little goes a long way—only 0.25 to 3.0% is needed for many applications. Equipment can be kept simple—just tumble or mix Attacote with your product. It goes right to work! An evaluation of Attacote with your product may bring a better solution to your problems. Let us help . . . this is a *starred* item . . . use the coupon.



Porocel—Isomerization Catalyst Carrier—helps maximize quantity and quality of av-gas and motor fuel

Porocel, activated bauxite carrier for the $AlCl_3$ catalyst in isomerization of normal butane to isobutane, is an attractive tool for refiners in today's octane race. A low capital cost features this time-tested process. Putting $AlCl_3$ on Porocel is a simple step for the refiner, who then has a supported catalyst with rigidly controlled particle size, natural ore ruggedness, high adsorptive capacity, uniform $AlCl_3$ dispersal, inertness, low cost, and freedom from impurities—a catalyst which promotes clean-cut, smooth reactions at a high yield/catalyst ratio.



Printing Inks with ASP's give printer the clarity and finish he seeks

With a choice of the new surface modified organophilic grades or the unmodified hydrophilic pigments, more printing inks now benefit from the superior soft texture, ease of dispersion, suspension properties, and economy of M & C's ASP aluminum silicate pigment extenders. They're grit-free, fractionated to narrow particle-size ranges to give that performance. Look into the ASP's...use the coupon.

Use this quick two-check coupon ▶
✓ your product interest . . .
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we'll fill your request immediately.

For more data, see your 1959 Chemical Materials Catalog, Pages 192-196

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I'm interested in:
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data; samples; prices; technical representative

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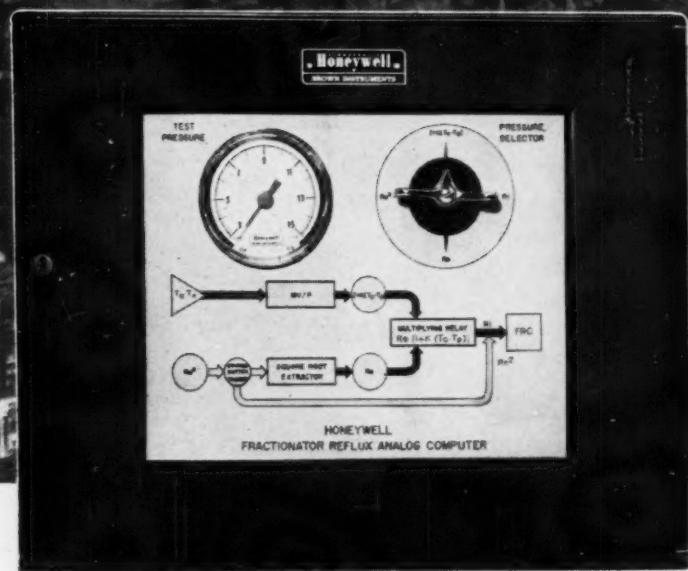
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Stabilize Fractionating with new Honeywell



HONEYWELL FRAC CONTROLLER IS EASY TO USE AND MAINTAIN

- Standard Honeywell components, packaged in a standard Honeywell strip chart recorder case—completely wired and internally piped.
- Only four simple, easily accessible process connections required to put the unit in operation.
- Chassis pulls out for front-of-case servicing, simplifying adjustment and maintenance for your instrument technicians.

COMPONENTS

MV/P (millivolt-to-pressure) Transmitter

- Fully transistorized

- Continuously sensitive to temperature change
- Constant voltage supply
- Simple span and zero adjustments

Pressure selector and test pressure gage

- Provide check of all pneumatic pressures within the computer for simplified trouble shooting.

By-pass switch

- Permits switching from *FRAC* control to conventional external reflux flow control.

Column Operation

FRAC* Controller

- Easily installed and maintained by present instrument technicians
- Savings realized justify installation
- Tamper-proof design

This new Honeywell control system immediately adjusts column operation to the effects of ambient temperature on overhead product condenser and external reflux. It continuously computes internal reflux flow, to maintain the most efficient, economical fractionating tower operation.

The new method, originally developed and licensed by Phillips Petroleum Company, utilizes a simple Honeywell analog computer employing standard Honeywell electric and pneumatic instrument components.

By correcting instantly for temperature deviation, the new control system offers the following economies.

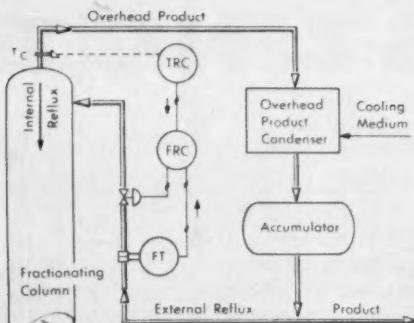
- Less reboiler heat is required, because large surges of internal reflux that would lower temperature are eliminated.
- Reduction in off-specification product minimizes re-runs and the need for intermediate storage.
- Closer control permits fractionator to operate closer to the flooding point.

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

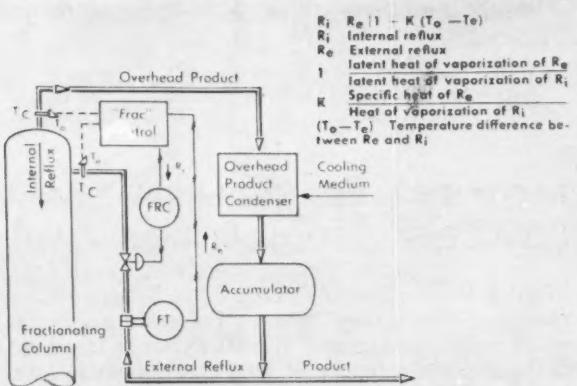
MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

*Fractionator Reflux Analog Computer. Trademark, Minneapolis-Honeywell Reg. Co.

from Honeywell...  ANOTHER DIAMOND JUBILEE PRODUCT



PROBLEM with existing fractionator control systems—Column is upset when temperature of external reflux is indirectly affected by changes in atmospheric conditions or in the temperature of the cooling medium to the condenser. Result: off-spec product, wasted reboiler heat, lower fractionator capacity.



SOLUTION: FRAC Controller (1) measures external reflux flow rate (R_e) and the temperature difference between the overhead product (T_o) and the external reflux (T_e); (2) computes internal reflux flow rate (R_i); and (3) holds it constant by adjusting external reflux flow rate for efficient fractionator operation.

Monsanto Task Force Chemicals...



*Actamer, Santobrite,
Santophen 1*

**CONQUER MICROORGANISMS FOR
"GERMProof" PAINTS, COSMETICS,
WALLBOARD, LAUNDRY**

Today, "germproof" has become a magic selling word for companies that market products to a germ-conscious public. Monsanto supplies a line of compounds that destroy, disarm, or discourage microorganisms for "germproof," "odorfree," "spoilage-proof" products. Examples: SANTOBRITE, widely used to make non-spoiling, germ-discouraging wall paint, moldproof cellulosic insulation and wallboard; also used in solution form in laundry rinsing to prevent molding of wet-stored linens, a benefit that soon may be combined with bleaching and starching... SANTOPHEN 1, another low-toxicity-to-humans compound, combines surprising mildness to the skin with the highest potency for killing *staph* organisms... ACTAMER, soap and cosmetic bacteriostat, now finding new uses for controlling bacteria-caused odors in a variety of sun-tan creams and feminine hygiene preparations; also attracting interest for use in paper to make "antiseptic" wrappings.



Sulfasan R

**ECONOMICAL VULCANIZING AGENT
GIVES RUBBER HIGHEST HEAT
RESISTANCE—ENDS BLOOM**

You can give your rubber products good heat resistance—at a reasonable cost—and eliminate unsightly bloom by partial replacement of conventional curing agents with SULFASAN R. This unique vulcanizing agent also provides greater safety from scorch and can boost modulus, reduce compression set and improve aging. In some compounds it trims the cost by reducing the total amount of vulcanizing agent required. As little as 0.8 to 2 parts of SULFASAN R per hundred of rubber, plus a small amount of THIURAD (tetramethylthiuram disulfide), is usually sufficient to achieve good results in GR-S, butyl, nitrile and natural rubbers. And SULFASAN R is non-discoloring; it can be used in white and light-colored stocks.



Vanillin

**GIVES PAPER A BETTER SMELL FOR
GREATER "SELL"**

Paper makers and paper converters are finding that the faint, pleasing odor of vanillin helps them gain a better competitive position. Vanillin hides the natural boxboard or paper odor—imparts a light, fresh cookie-like fragrance. By offering the pleasant smell as an "extra" benefit—paper marketers are gaining business in bakery wrap and bags, in paper and paperboard for drug packaging, in candy wrap, and even boxboard for packaging kitchen utensils. Application is simple: a faint powdering or a mist-spray of vanillin solution in water gives paper or board a mild, pleasing aroma that is stable in odor character and long lasting.

Mission today:

A DISTINCT

**MONSANTO CAN PUT A TASK FORCE OF CHEMICAL
"SALES-ADVANTAGE BUILDERS" AT YOUR COMMAND**

Want a Distinctive Difference That Sells... flame resistance? lower cost? "germ proofness"? a pleasant odor? better appearance? Whether your "consumer" is the American family or a special industrial market, most of your prospective buyers are looking for plus values and extra benefits like these. Here are some Monsanto materials that impart this type of

competitive edge to a variety of products. Perhaps the sales advantages in these applications, or others that occur to you, can be developed in your particular product. Why not check into the possibilities right now while you're thinking about it. Write to: Monsanto Chemical Company, Task Force Chemicals, Dept. C, St. Louis 66, Missouri.

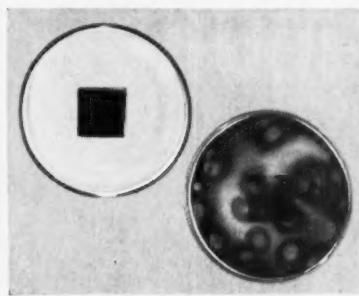


Orthonitrochlorobenzene

BASE FOR A VARIETY OF LOW-COST AROMATIC END PRODUCTS

Marketing advantage: good quality at the lowest price. For the diversified-organic-chemical maker, *o*-NITROCHLOROBENZENE can be one of the cheapest starting materials to a whole variety of substituted aromatics with specialized commercial uses that could represent significant markets. Its highly reactive chlorine is the key to creative synthesis. Ordinarily, an aromatic linked chlorine atom *will not react* in displacement-type reactions. In ONCB, however, the $-NO_2$ radical makes the chlorine in the *ortho* position highly reactive. Dozens of substituents can be readily fixed to the ring (with high yields) in place of the chlorine atom. The cost of the starting material in tank car quantities is so low that ONCB can be converted with a variety of low-cost reactants to make a large number of other substituted aromatics that serve dozens of specialized uses. This makes ONCB a prime starting point for custom specialty manufacturers.

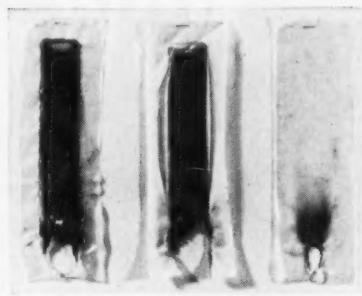
(For a route map to over a hundred compounds, request a copy of ONCB derivatives chart.)



p-Toluenesulfonamide

FREES PROTECTIVE COATINGS FROM MILDEW AND FUNGUS ATTACK

In varnish or paint films, *p*-TOLUENESULFONAMIDE imparts unusual protection to damaging attack by microorganisms. Although many compounds show fungicidal ability, most are inactivated by incorporation into varnish or paint. *p*-TOLUENESULFONAMIDE maintains its fungicidal power, even when blended—kills fungus as shown in test above. It is readily compatible with varnish vehicles, and as little as 2% makes the films mildew-proof. Two-year exposure tests in the jungle under hot, humid, tropical conditions showed that test ropes impregnated with a good spar varnish (phenolic resin and tung oil) containing *p*-TOLUENESULFONAMIDE were free of the damaging fungal attack that virtually destroyed the controls. A white crystalline powder, *p*-TOLUENESULFONAMIDE is free-flowing, inexpensive and nonirritating. One fast-growing application: electronic equipment coatings. Signal and electrical control equipment often fails in hot, humid environments due to fungal growth on the units. Varnish films containing *p*-TOLUENESULFONAMIDE give such electrical equipment complete protection.



Santicizer 141

MORE EFFICIENT PHOSPHATE-TYPE PLASTICIZER BOOSTS FLAME-RETARDANT VINYLS

To provide film, sheeting and coatings with the distinctive feature of flame resistance, most vinyl processors now select SANTICIZER 141. It improves light stability, tear resistance and low-temperature flexibility. Films using it may have as much as 50% more tear strength than films plasticized with straight DOP. And SANTICIZER 141 is a *low-cost, nontoxic* primary plasticizer. It has low volatility, good resistance to solvent and water extraction, excellent resin compatibility and practically no odor. For upholstery, tents, tarpaulins and covers, belting, tapes, rainwear, coatings, films and other vinyl products where flame retardance promotes sales, be sure you check out SANTICIZER 141.

SALES ADVANTAGE



Watch Monsanto's science documentary, "CONQUEST," CBS/TV, Sun. Afternoon.

• • • For more details, use handy coupon • • •

Please send more information about:

- ACTAMER
- SANTOBRITE
- SANTOPHEN 1
- SULFASAN R
- VANILLIN
- ORTHONITROCHLOROBENZENE
- p*-TOLUENESULFONAMIDE
- SANTICIZER 141

MONSANTO CHEMICAL COMPANY

Task Force Chemicals, "Advantage Builders C"
St. Louis 66, Missouri

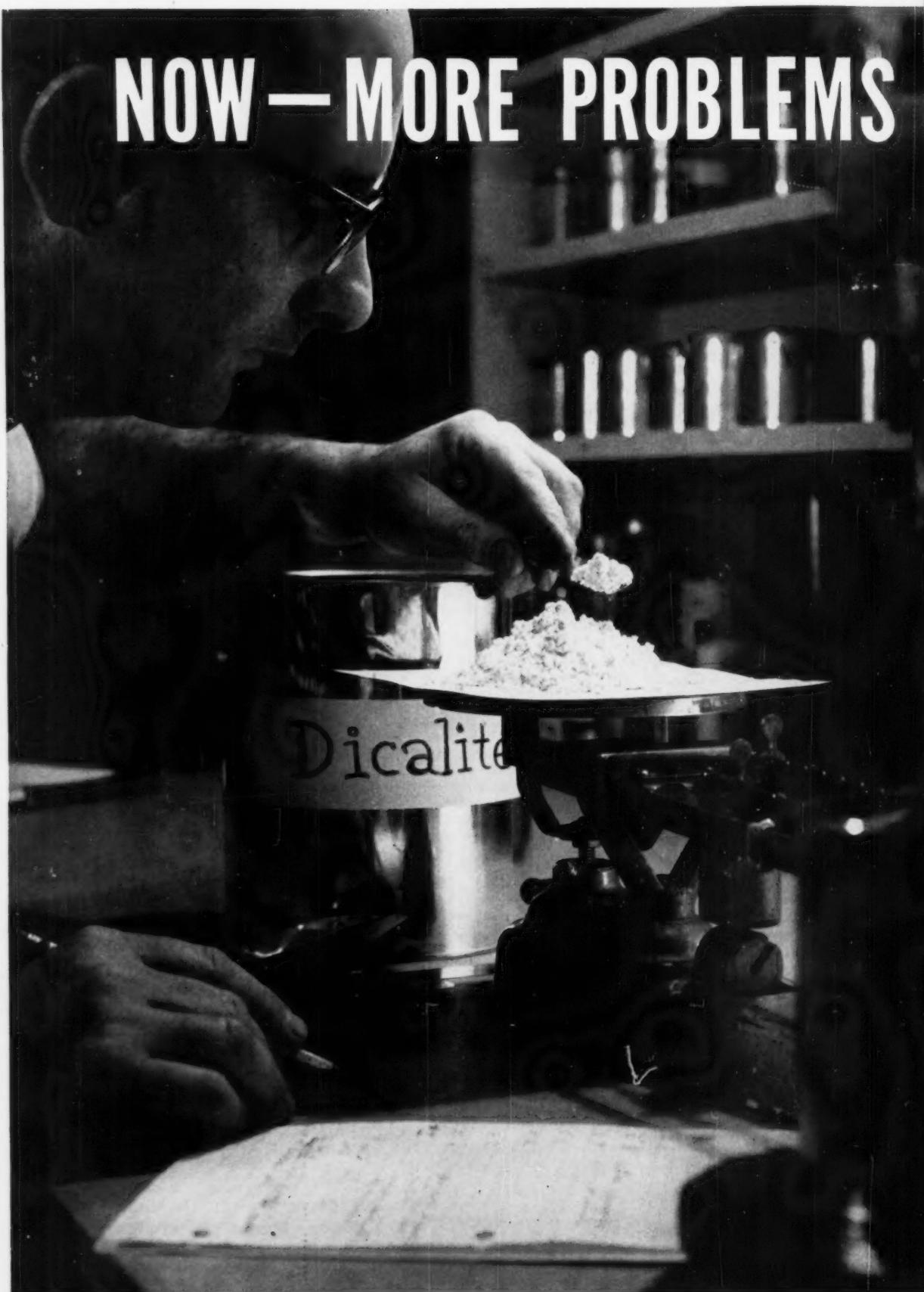
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NOW—MORE PROBLEMS



SOLVED WITH DICALITE FILLERS

NEW MATERIALS INCREASE RANGE OF APPLICATIONS

Dicalite has added new products to its family of filler materials, as well as new quality control measures. Now, diatomite, perlite and carbon-based materials are available to meet industry's widest range of filler applications.

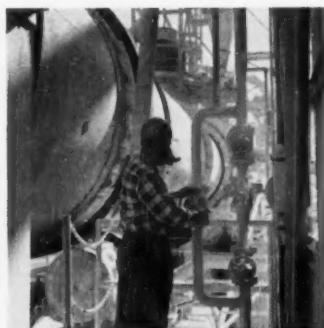
Because of their unique particle structure and their physical and chemical properties, Dicalite filler materials are used in a tremendous variety of ways—in paint, paper, rubber, plastics, resins, cements, fertilizers, insecticides, horticultural mediums, as catalyst carriers, absorbents, etc.

They offer tremendous surface area and porosity, great bulk in relation to weight, high absorptiveness, and structural reinforcement in many uses. All are chemically and physically stable in practically all applications. Diatomite is used in many high temperature insulations; perlite is especially effective in cryogenic applications.

Dicalite filler materials may provide an answer to your filler problem. Call the Dicalite man and see.



Careful strata selection provides the best crude for each product's final requirements.



New processing refinements, including special calcining methods, control product characteristics with an accuracy never before possible in any plant.



With more than 22,000 quality control tests every month, the Dicalite plant laboratories hold every product grade to rigid specifications.



New automatically-controlled packing and pressure-palletizing is the final step in efficient modern operation.

Dicalite®

Dicalite Department
Great Lakes Carbon Corporation
612 So. Flower Street, Los Angeles 17, Calif.

I am interested in these aspects of filler materials

Bulking Structural Extender Carrier Insulation

Type of product or material _____

Send information Have Dicalite man phone for appointment

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____

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CW-2



Chemicals from Armour for Textile

In the past several years, Armour's research men have spent considerable time studying the needs of the textile industry. The information and chemicals featured here are related to some of the more important areas that have been investigated. These Armour cationic chemicals offer substantial improvement over many presently used chemicals. Particular attention should be given to the effectiveness of these Armour chemicals with the many synthetic fibers that are currently so popular.

Improved starch sizes

The use of unmodified starch as a textile warp size has certain disadvantages. The addition of small amounts of an *Arquad*[®] can overcome some of these faults. Tests of Arquad 12-33, at a use level of 4 oz. per 200 gals. of starch formulation, show the following advantages:

Increased tensile strength and improved elasticity. Numerous tensilometer tests have shown such improvements in cotton yarn.

Better penetration. Better penetration leads to a more even deposition of the starch. Less flaking of the more flexible film and less shedding of fine fiber ends were noted.

Lower viscosity. A small reduction in initial viscosity was obtained and starch solids stayed in suspension longer. Gel formation of the cooled solution was reduced.

Dye-leveling aids

Armour's *Ethoquad*[®] (Polyethoxylated Quaternary) compounds are doubly important because their use proves valuable in the two major steps that occur in the acceptance of a dye by fiber.

In the first stage, when dye and fiber initially meet, the Armour chemicals act as dye-retarding agents and slow the initial rate of dye exhaustion. The Ethoquads, being cationic surfactants, reduce the rate of initial exhaustion and permit a more gradual deposition of the dyestuff for uniform dyeing of the fabric.

In the second stage of dyeing, penetration into the

inner portions of the fiber occurs. Improper absorption would result in uneven distribution, with high dye concentrations only on the outer skin of the fiber. Here again, the Ethoquads do a superior job. They reduce surface tension and aid in wetting the fabric. In addition to greater dye penetration, the Ethoquads help establish a more favorable adsorption-desorption equilibrium to equalize dye concentrations over the surface.

Initial tests of the Ethoquads as dye-levelers indicate that improved processes and products will result from using these quaternary ammonium compounds.

Durable water repellents

Although there are several types of water repellents in use today, it is generally recognized that the more versatile and durable types are based on fatty amides. Derivatives of Armour's *Armid*[®] HT offer many advantages in this application.

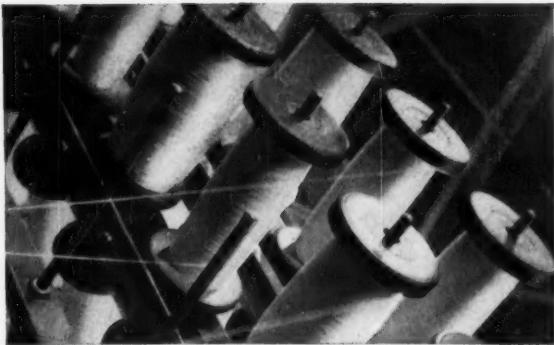
These derivatives of *Armid* HT are modified into thermally unstable quaternary ammonium salts. These salts are applied to fabrics from an aqueous dispersion and converted under heat, probably leaving an insoluble, durable methylene bis-stearamide water-repellent residue within the fabric. Repeated washings or dry cleanings have little effect on the repellency properties of treated fabrics. This same finish also permits the fabric to "breathe," and enhances wrinkle-resistance.

The excellent water repellent properties of the *Armid* HT derivatives are due mainly to the combination of the amide groupings with the long, saturated straight chains. These compounds have high-melting points and are poorly emulsified with ordinary soaps and detergents, which makes them highly resistant to laundering.

Anti-static agents

In an effort to obtain more satisfactory anti-static agents for textiles, Armour tested more than one hundred different compounds.

Results showed that three classes of Armour compounds had marked superiority. Armour's *Ethoquad*



Processing

series, *Ethomeen® R/12* series, and Arquad series proved to be excellent anti-static agents for a wide range of textiles. In some cases it is recommended that a combination of Ethomeens and Arquads be used for most satisfactory results.

The Ethoquads are especially suitable when operations require removal of anti-static agents after processing, because they can be easily removed from fibers with a warm water rinse. Generally, as little as 0.1 to 0.2 percent of Ethoquad will reduce processing difficulties caused by static charges.

Manufacturers of wool-synthetic blends, made on faster processing machinery, should be particularly interested in these compounds. Use of some of these Armour anti-static agents will allow them to maintain quality and, at the same time, speed-up production.

A number of these Armour compounds also exhibit good softening properties on various fibers.

Fabric softeners and conditioners

Arquad 2HT is most notable for its softening effect on cotton without imparting surface oiliness. This positively charged chemical is attracted to the negatively charged textile fibers. The chemical molecule then orients itself around the fiber, leaving two fatty chains exposed to give maximum surface softness.

Arquad 2HT is compatible with many of the common finishing agents such as dextrins, glue, gelatin and the polyvinyl acetate and/or chloride emulsions.

Arquad 2HT is used as a basic ingredient by manufacturers of fabric conditioners for home or commercial laundry use. Arquad 2HT is not a water softener, soap or detergent, but a fabric softener. Results are exceptional because the Arquad is a fabric softener which also eliminates static electricity, makes ironing easier, improves the appearance of wash 'n wear items, and promotes faster drying. Fabrics can be dried indoors, outdoors or in a dryer with the same fine softening effect.

For additional information on all these Armour chemicals for textile processing, and for samples for your own testing, use the convenient coupon.

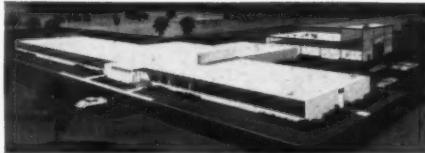
NEW DEVELOPMENTS FROM ARMOUR

New research lab and pilot plant

A new research laboratory and pilot plant will be erected soon for Armour Industrial Chemical Company. Expanded research facilities are required to broaden the advancements in long-chain aliphatic chemistry. The two structures will be built adjacent to the Company's chemical plant at McCook, Illinois, 15 miles southwest of Chicago's Loop.

The laboratory section will provide ample space for an integrated research program starting with new or modified chemical compounds, through the determination of their physical and chemical properties to application evaluations in many different areas.

The pilot plant will cover approximately 4,000 sq. ft. It will be equipped with versatile types of reactors and stills for handling chemicals on a larger scale than the laboratory. Occupancy is scheduled for late fall of this year.



Leader in progressive fatty acid chemistry

Armour Industrial Chemical Company

© Division of Armour and Company

Send for information and samples

Send additional information on:

Starch sizes
Dye-leveling
Water repellents
Anti-static agents
Softeners and conditioners

Send a sample of _____

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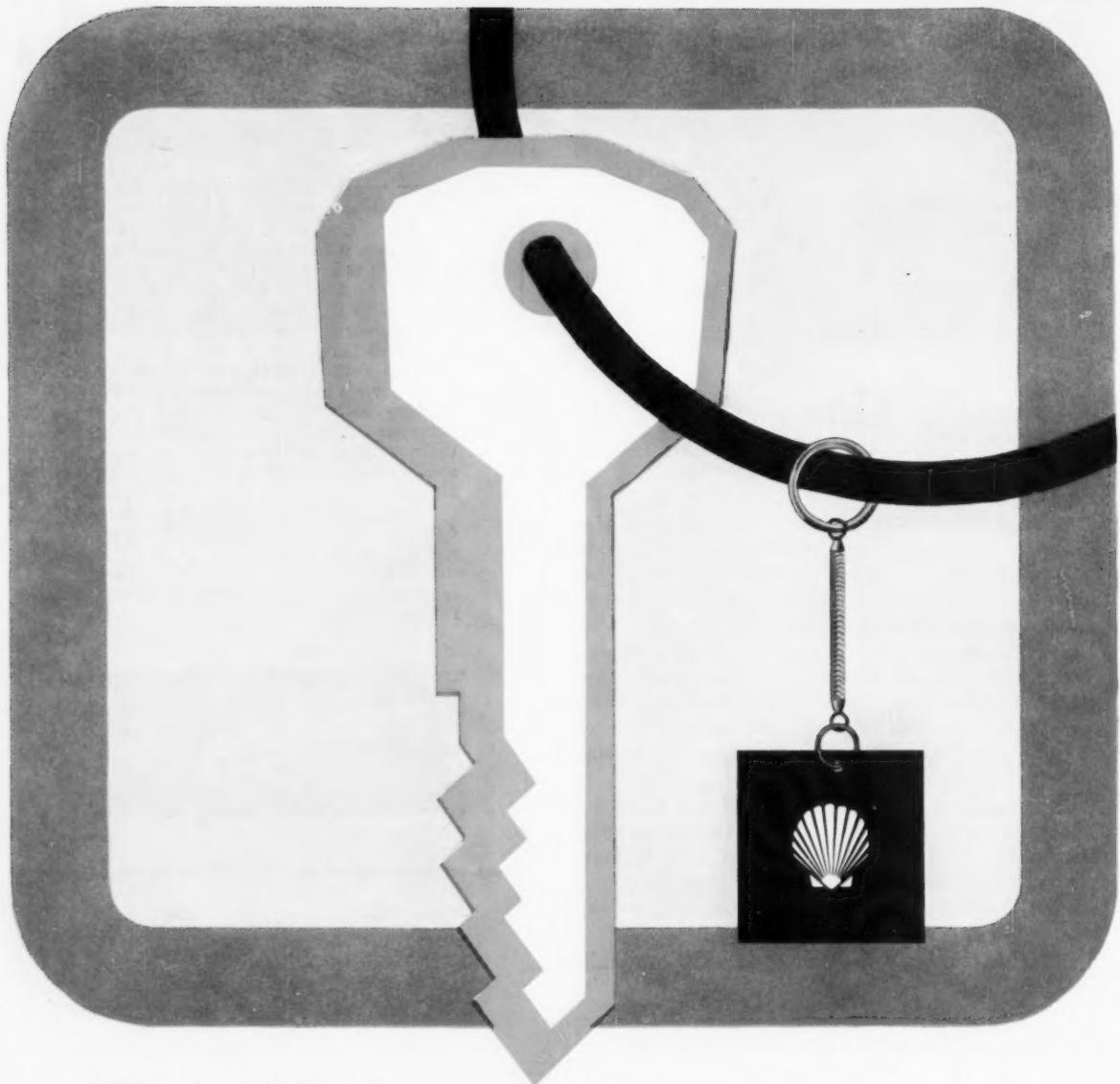
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CW-6-60

Armour Industrial Chemical Company • 110 N. Wacker Dr., Chicago 6, Ill.



MEK solvent power...

...key to economical, high-performance solvent systems

High-purity methyl ethyl ketone is among the most versatile low-boiling solvents available to the surface coating industry. Its strong solvency for lacquer resins has made it a favorite with formulators.

Because its stronger solvent power gives solutions of lower viscosity, higher solids, and greater diluent tolerance—MEK is a preferred replacement for many other low-boiling

solvents. The high diluent tolerance of MEK makes possible lowest cost formulations because the proportions of aromatic and aliphatic solvents may be increased.

Technical assistance, backed by years of experience, is available from Shell to assist you with surface coating problems. For more information, write or phone your nearest Shell Chemical office.

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INDUSTRIAL CHEMICALS DIVISION

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Business Newsletter

CHEMICAL WEEK
June 18, 1960

Allied Chemical's next nylon project—a \$35-million plant to produce fine-denier nylon yarn for use in textiles—is in the final decision-making stages this week. Officials of Allied's National Aniline Division are now evaluating several alternative site and construction proposals. Some considerations suggest that Virginia's Chesterfield-Hopewell vicinity might have the inside track, since Allied's caprolactam plant is at Hopewell; but the division is also sizing up sites that are closer to textile companies' spinning and weaving mills. One such location reportedly getting close examination: Irmo, a small town about 10 miles northwest of Columbia, S. C.

Newest threat to producers of rayon tire cord: Du Pont last week disclosed plans to more than double its nylon yarn capacity for tire cord and other industrial products at its Richmond, Va., high-tenacity yarn production facilities. Plans call for the installation of additional nylon producing units plus increasing production of the existing plant. When the expansion is completed during the second half of 1961, the plant's capacity will have jumped to 100 million lbs./year from the 40 million lbs./year of the original plant.

The remark by Du Pont's Rollin F. Conway, manager of fiber operations at Richmond, that the new facilities will incorporate a new, low-cost manufacturing process yielding superior nylon yarn strikes a further disquieting note to rayon tire-cord producers—who are already straining to adjust to nylon cord's rising production and diving price (see p. 41).

Look for further chemical expansion by Borden. Company President Harold W. Comfort told stockholders at the annual meeting that about 6% of the company's sales volume now is in chemicals; that 17% of the \$31-million capital expenditure of 1960 will be spent on chemical activities, and that the firm "seriously is considering expanding chemical activities on a broader scale" (*CW Business Newsletter*, May 21).

Though Sun Chemical Corp. is stressing chemical growth (p. 44), it's not neglecting its traditional lines: it has just opened at Cincinnati its ninth new ink manufacturing plant built in the past year. Part of Sun's record capital expansion program, the new plant is one of 39 Sun ink plants in the U.S., Canada, Mexico and Venezuela. Projected printing ink sales for the U.S. by 1970: \$100 million/year, according to Sun President Norman E. Alexander.

Other expansions and acquisitions this week:

- Hooker Chemical directors have approved plans for a new multimillion-dollar plant near South Shore, Ky., to produce synthetic phenol by a modified chlorination process. The process is said to be the

Business Newsletter

(Continued)

result of research and development work on the Raschig process now utilized by Hooker's Durez Division at Tonawanda, N.Y. Construction will begin later this year, and completion is anticipated by the end of '61. A 165-acre site on the Ohio River, about five miles upstream from Portsmouth, O., has been optioned by Hooker; and other facilities for this site reportedly are in the preliminary planning stage.

• Rexall Drug & Chemical is negotiating the transfer of Schenlab Pharmaceuticals, Inc., Schenley's ethical drug division, to Rexall. If the move is carried out, Schenlab would become part of Riker Laboratories, Inc. (Northbridge, Calif.), Rexall's ethical drug subsidiary.

• Michigan Chemical Corp. (Saint Louis, Mich.) will spend about \$300,000 for new semiplant equipment for production of fine chemicals and organic and inorganic intermediates manufacturing facilities. This will enable the company to expand its custom production of various chemicals in quantities from 1,000 to 1 million lbs./year.

• Minerals Engineering Co. (Grand Junction, Colo.) has purchased from Howe Sound Co. (New York) a \$1.4-million refining plant near Salt Lake City to produce vanadium pentoxide for atomic energy uses. Production is anticipated for fourth-quarter '60.

Scratch off chances for a European free-trade area in the near future. That's the conclusion you can draw from last week's Paris meeting of the "Committee of 21"—representing members of Europe's two trading blocs, the U.S. and Canada—which sat down to study the trade problem arising from the Common Market's discrimination against outsiders.

The committee rejected the idea of building a bridge between the two blocs—the approach advocated by the "Outer Seven" members. Instead, following Common Market thinking, it set up a study group to decide which specific commodities will be most affected by the external tariff walls of the two groups. At this fall's session of the General Agreement on Trade, reciprocal tariff cuts on these products will be worked out—although the Common Market probably will not go farther than the conditional 20% cut in its eventual common tariffs that it offered last month.

Thus, while some key points of friction between the two blocs may be smoothed out, most chemical producers outside the Common Market still face the prospects of discrimination—although it's liable to be somewhat less than originally feared when the Common Market was set up. As a concession to the seven, the committee will continue to study "long-term aspects of trade relations," but this takes a back-seat to the item-by-item approach.

Right now, business looks pretty good. The U.S. Dept. of Commerce calculates that first-quarter sales of chemicals and allied products were up 15.5% from last year, and that April sales (preliminary) were up 8.6%. Standard & Poor's predicts these gains in earnings this year: Dow, up 30%, to \$3.10/share; Allied, up 20%, to \$3; Diamond Alkali, up 15%, to \$4.50; Hercules, up 14%, to \$3.10; and American Cyanamid, up 12%, to \$2.75.



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June 18, 1960.



Beaunit's Rogosin: He's confident the Hercules merger will go through.

New Fiber-Chemical Allies?

Disclosure that Hercules Powder and Beaunit Mills, Inc., are contemplating merger underscores the strange pairings now likely to result from the intensifying competition and increasingly interwoven activities of chemical and fiber producing industries. It also re-emphasizes that the fiber makers are the more eager partners in any such merger plans.

This is made very clear by the way Beaunit and Hercules describe the state of negotiations. Beaunit expresses confidence that merger will be consummated within a few months — as Beaunit's 73-year-old chief executive, Israel Rogosin, told CHEM-

ICAL WEEK, "Beaunit and Hercules would have the combined efficiency and know-how to face the very difficult competition coming in both chemicals and fibers."

On the other hand, Hercules' President A. E. Forster termed the reports "premature," and other HPC spokesmen expressed "utter bewilderment" at rumors of such a venture.

The fact that merger discussions were revealed by Rogosin before a full agreement had been reached further points up fiber makers' longing to tie up with chemical makers. But the textile producer's philosophy may be a bit hard to swallow for a com-

pany such as Hercules — which has its foundation in cellulose chemicals, petrochemicals, naval stores and explosives.

Taking the Initiative: Thus it appears that Beaunit has been making the advances. "What Rogie wants, Rogie gets," one trade journal commented last week. But Rogosin amends this statement: "Rogie wants only what he knows will fit best into his company's patterns for growth, and will work until he succeeds in getting it." And he's convinced the move is "not diversification, but solidification."

Rogosin feels that the two companies definitely can mesh. Since 1926, he said, Hercules has been supplying Beaunit with pulp made from cotton linters. Both cotton and wood cellulose are used in Beaunit's American Bemberg Division operations at Elizabethton, Tenn. And until recently, Hercules cellulose made up 62% of the raw material for rayon tire cord by Beaunit's North American Rayon Division, also at Elizabethton.

Of more recent significance: Beaunit is now launching its Goodyear-developed modified polyester, Vycron, under license from the rubber firm. Hercules is currently the biggest independent producer of dimethyl terephthalate, used for such polyester fiber production. Its 12-million-lbs./year plant at Burlington, N.J., is being tripled in capacity (CW, Oct. 10, '59, p. 18). Moreover, according to Rogosin, "after the ICI-Du Pont polyester patents expire in this country in '61, Beaunit would be in a position to use either the Goodyear or the ICI-Du Pont type of unmodified resin."

Enter Polypropylene: But even more important, Rogosin feels that his company is particularly suited to go all out in polypropylene as a textile fiber. And Hercules' plastics development officials have been rooting for polypropylene as a potential major fiber since its commercial bow two years ago. HPC technologists are claimed to be well on their way toward solving the dyeing and finishing problems inherent in early stages of

most synthetic fibers manufacturer.

Beaunit has just launched pilot-plant operation for processing polypropylene for both textile and industrial yarns. Rogosin sees a substantial future for polypropylene in unblended tricot, in blends with other fibers for dresses and suits, in carpets by itself or in blend, and in applications from pillow stuffing to robes.

Cooperation between Beaunit and today's prime producer of polypropylene, Rogosin feels, would put both companies out front.

Thus keen interest on the part of Hercules, coupled with Rogosin's faith that polypropylene fiber will become a major contender in apparel and home furnishings, may be the key point in the merger talks.

Rogosin, however, sees other areas of common interest. "Hercules-Beaunit," he asserts, "would be in first place in rayon, nylon, polyester—and polypropylene—not on the basis of sales total, but in efficiency and low-cost operation."

Industry Admiration: Other industry sources concede Beaunit's efficiency and low operating costs, credit the company with having done (1) an outstanding job in Tyrex production in a short time, leading to licensing of its process to companies all over the world, and (2) a good job of producing and using nylon yarn.

But textile observers feel that "in an industry where profitability is associated with huge volume, Beaunit produces in relatively minute quantities."

Present estimates of Beaunit's capacity: tire yarn, 60 million lbs./year; rayon textile yarns, 30 million lbs./year; rayon staple and tow, 10 million lbs./year; and nylon for textiles and equipment, 2.5 million lbs./year. Next, Beaunit will add capacity for 12 million lbs./year of polypropylene yarn. All these facilities are centered at the company's American Bemberg and North American Rayon plants in Elizabethton.

Rogosin and other fiber producers agree, however, that in order to sell a new fiber in today's glutted market, a chemical company must follow its product through to the end-product. Beaunit, which weaves, knits, dyes and finishes, sells to manufacturers and even makes some underwear products in its own mills, could help a chemical company on many a product development problem. (Two com-

panies experiencing just such problems: Dow with its Zefran and Cyanamid with Creslan.)

Also, for Beaunit, growing competition from nylon tire-cord makers is a compelling motive for greater stress on diversification. This holds despite Rogosin's assurance that his firm can meet any tire-cord price competition.

It's logical to suppose that Beaunit's 6,700 stockholders and the holders of about \$19.4 million worth of 4 1/4% debentures are strong for a merger that would offer new technology, an assured source of supply and continuity of management. Industry men have called Beaunit a "one-man show"; Rogosin—who has been in textiles since he was nine years old—heatedly denies this.

True or not, Beaunit is considered by fiber producers to be one of the big hubs around which the intricate textile business revolves. Some of those producers are perturbed about having an "outsider" like Hercules enter the fiber-fabric complex. And aside from its lack of familiarity in that field, Hercules has to consider whether a tie to Beaunit would put Hercules so deep in fabrics that it would be competing against potential fiber resin customers.

But Rogosin, asked if he could confirm that the merger proposal called for 40 shares of Hercules common for 100 shares of Beaunit, confidently replied: "It's not officially decided yet, but it will be 41 1/2 shares of Hercules for Beaunit's 100." And industry men allow that "Rogie" may be right again.

Living Up to a Name

Last week's moves by Sun Chemical Corp. (New York), coupled with other recent developments, all add up to an intent to make this a chemical firm in fact as well as in name.

Latest steps in this direction:

- Appointment of a chemical research executive to fill a newly created position, vice-president-research.
- Acquisition of land for a 100%-owned chemical operation to be established in South America.
- Consolidation of the Chemicals Group's Electro-Technical Products (Nutley, N.J.) and Facile Products (Paterson, N.J.) divisions—both large users of synthetic resins for specialty coatings, laminates, insulations, films,

fabrics, tapes.

Joining Sun to develop a corporate research program "oriented more closely toward the chemical industry" is Samuel McFarlane, Jr., formerly manager of central research laboratories for Celanese Corp. and later a vice-president-technical director of Onyx Oil & Chemical Co. (Jersey City, N.J.). McFarlane—who started at Celanese as a research chemist in '39—has specialized in synthetic fibers, surface-active agents, polymers and catalysts.

Fastest Growth in Chemicals: Though still small, compared with Sun's older operations in printing inks and paints and finishes, the Chemicals Group—headed by Vice-President Eric Blackstead (also formerly a research chemist)—is the fastest-growing part of this diversified corporation, whose '60 sales may come close to \$60 million.

Sun doesn't specify what percentage of that sales total is accounted for by the chemical divisions, but the breakdown of manufacturing plants may be a rough indication: the Graphic Arts Group has 30 U.S. and five foreign plants; the Paints and Finishes Group, eight U.S. and one foreign; and the Chemicals Group, seven U.S. and three foreign.

Building up of the Chemical Group accelerated in the latter part of '59 with acquisition of Facile Corp. and Pennsylvania Color and Chemical Co. (Doylestown, Pa.), acquisition of majority interest in Societe des Produits Warwick (Paris, France), establishment of Williams-Ansbacher (Middlesex, England), and expansion of the Ansbacher-Siegle Division's facilities on Staten Island, N.Y.

New Development Planner: In addition, Blackstead brought in Peter Hereld—previously executive vice-president of Chemo Puro Mfg. Corp. (now a branch of Century Chemical Co.)—to serve as director of planning and development for the Chemicals Group.

With the recent acquisitions and various new products, Sun President Norman Alexander is projecting a more than 10% growth for the Chemicals Group this year. And with the stepped-up research and development program and a policy for still more expansion, even bigger gains are foreseen for following years.



Britain's Garrett, U.S. Rubber's Humphreys speak of overseas trade; Shell's McCurdy to head MCA.

Global Outlook Stressed at MCA Meeting

Shoptalk about merger possibilities, business trends, and overseas competition and opportunities engrossed a record turnout of some 850 industry executives at the 88th annual meeting of the Manufacturing Chemists' Assn., held late last week at White Sulphur Springs, W. Va.

Relatively cool weather—with high temperatures in the 70s—encouraged golfing and other outdoor pastimes.

In business sessions, the delegates—representing 160 of MCA's member companies—elected new officers for the coming year: Shell Chemical Co. President Richard C. McCurdy was chosen to succeed Merck & Co. president John T. Connor as MCA chairman. General John E. Hull, who was re-elected as full-time president, reported on last year's progress, current problems, and the adoption of an \$896,000 MCA operating budget, 14.9% higher than last year's.

Countering Additive 'Scares': Hull explained that the increase would be needed to finance a newly adopted informational program aimed at achieving a better understanding of the use of chemical additives in foods. MCA's board of directors, he related, has given preliminary authorization for retaining the firm of Glick &

Lowwin, education consultants, to prepare materials designed to provide accurate and pertinent information about food additives to nutritionists, dieticians, educators, and other professionals in the food technology field.

Stressing World Trade: Two of the principal speakers at the three-day meeting—Harry E. Humphreys, Jr., chairman and chief executive officer of U.S. Rubber Co., and Sir William Garrett, chairman of the Assn. of British Chemical Manufacturers—discussed current developments and trends in international trade. The other—Arthur S. Flemming, U.S. Secretary of Health, Education and Welfare—was introduced by Connor as "Daniel in the lion's den." He discussed forthrightly inevitable differences that arise between a regulatory body and those being regulated, and told about investigations he has ordered (*CW, June 11, p. 24*).

Garrett—speaking as head of the British counterpart of America's MCA—said that chemical industry leaders throughout Europe are seriously concerned about international trade policies in that continent. He added they do not regard either the European Common Market or the seven-nation free-trade area as the

final answer. He said industry associations have recently organized a Council of European Chemical Federations, headquartered in Zurich, Switzerland, to discuss and exchange information on capacities, tariffs, import quotas and taxes, and to boost trade between European nations.

Eyeing Communists' Deals: Garrett also spoke of the potential impact of possibly subsidized exports from China and other Communist nations, and declared that the British federation—like MCA—is opposed to the sale of advanced chemical know-how to Iron Curtain countries. Garrett, who started in the industry as a research chemist, is now a member of the board of directors of Monsanto Chemicals Limited (London).

Humphreys advised that any company that now has some degree of tariff protection should "fight persistently to keep it." But he contended that from "a realistic, long-term view, high protective tariffs have no permanent place" in markets of non-Communist nations. He urged chemical producers to be ready to build plants in Western country and to "take advantage of great population groups that have recently acquired a thirst for economic growth."

Capital Outlays Holding Higher

Actual and anticipated expenditures on new plant and equipment, in billion dollars, as compiled by Dept. of Commerce and Securities & Exchange Commission.

	1959					1960				
	1st qtr.	2nd qtr.	3rd qtr.	4th qtr.	12-mo. total	1st qtr.	2nd qtr.*	3rd qtr.*	4th qtr.*	12-mo. total*
Chemical process industries:										
Chemicals and allied products	0.26	0.30	0.31	0.36	1.23	0.33	0.41	0.39	0.46	1.59
Pulp, paper and allied products	0.12	0.15	0.17	0.19	0.63	0.16	0.19	0.20	0.20	0.75
Petroleum and coal products	0.52	0.62	0.63	0.73	2.49	0.53	0.69	0.68	0.74	2.64
Primary nonferrous metals	0.07	0.09	0.07	0.09	0.31	0.07	0.08	0.09	0.11	0.35
Stone, clay and glass products	0.11	0.14	0.13	0.15	0.53	0.14	0.17	0.14	0.20	0.65
Rubber products	0.04	0.05	0.05	0.06	0.19	0.05	0.07	0.07	0.07	0.26
CPI totals	1.12	1.35	1.36	1.58	5.38	1.28	1.61	1.57	1.78	6.24
All manufacturing	2.46	3.02	3.02	3.57	12.07	3.09	3.79	3.73	4.31	14.90
All U.S. business	6.91	8.32	8.32	8.99	32.54	7.89	9.50	9.39	10.07	36.85

* Anticipated as of May 1.

Capital Spending—Dip Due for Reversal

A leveling-out of chemical process companies' capital spending is in evidence this week.

On one hand, the quarterly survey conducted jointly by the U.S. Dept. of Commerce and the Securities & Exchange Commission indicated that in most industries, there was a tendency during April and early May to cut back very slightly on planned expenditures for expansion and modernization this year. For all manufacturing industries, this cutback was a 1.5% dip from the 12-month total anticipated last winter.

Among process industries, the three-month changes ranged from a 10% cutback by producers of petroleum and coal products to a 7% increase by pulp and paper companies. Producers of chemicals and allied products shaved their '60 spending estimates 3%.

Recent Reversal Likely: But there are grounds for suspecting that this slight and statistically uncertain downward trend may have been reversed since that survey was taken. At least four developments can be cited as possible factors in such an upturn:

- Increasing pressure for a rise in defense spending. This stems from the more threatening attitude shown by Soviet leaders since the aborted summit meeting in Paris.

- The stock market's strong recovery, from the low of May 2 to last week's peaks.

- Last week's end of the decline in U.S. steel production, followed by the renewed prediction by Chairman Roger Blough of U.S. Steel that the industry's operating rate will climb in August as steel users again start inventory buildup.

- The recent finding—in the latest McGraw-Hill quarterly forecast of new orders for machinery—that equipment producers expect incoming orders to reach an all-time high in the third quarter of this year.

And so the recently calculated drop-off in capital spending—so small that some economists and statisticians doubt that it has any significance—might well have been a passing mood among business executives.

Highest Since '57: Even taken at face value, the government's new quarterly report still indicates that

most industries will be investing more money this year in new plants and equipment than in any previous year except '57. And at least one process industry—production of rubber products—now expects its '60 spending to top its '56 and '57 highs.

Here's the rundown on each process industry's '60 spending plans, as of late April and early May:

Chemicals and allied products—\$1.6 billion, down 3% from the figure anticipated three months earlier, but up 29% from the '59 actual total.

Paper and allied products—\$750 million, up 7% over three months, and 19% higher than the '59 total.

Petroleum and coal products—\$2.64 billion, down 10% from three months earlier, but up 6% from '59.

Primary nonferrous metals—\$350 million, down 5.4% between February and May, but a 12.9% rise from '59.

Stone, clay and glass products—\$650 million vs. \$680 million in February, but still 22.6% higher than last year's total.

Rubber products—\$260 million, up \$10 million from earlier plans for '60. Investment in '59: \$190 million.



Top Soviet economic planners study plastic-trimmed British car.

Plugging Plastics in Russia

Premier Nikita Khrushchev, top Soviet Union economic officials, several thousand Soviet technicians, and crowds of plain Russian citizens — some 75,000 visitors in all — swarmed through Moscow's Polytechnic Museum last week to see Imperial Chemical Industries' Plastics in Industry exhibition.

Months of preparation and considerably more money than ICI first expected ("tens of thousands of pounds") went into the show. Almost 90 of ICI's customers contributed some 2,000 display items, ranging from wire insulation to a one-piece sports boat (made by a U.S. process).

But the heart of the show was a series of seven technical lectures, accompanied by slides and motion pictures, on such subjects as extrusion of rigid PVC tubes, fabrication and industrial applications for thermoplastic sheets, etc.

In the courtyard outside the main show spectators watched Windsor & Son, Ltd., demonstrate a PVC extruder turning out some 4-in. rigid PVC pipe, and an injection molding machine producing 12-in. polyethylene bowls.

Bidding For Business: The show was ICI's most ambitious move to date to open up what it predicts will be a "quite tremendous" market for plas-

tics and plastic technology in Russia. So far, ICI's sales to the Soviet Union and other East European countries have not been monumental, but they have been growing significantly since 1958, account for a major proportion of total British chemical exports to the Communist bloc.

From \$5.32 million in '58, ICI's exports to Eastern Europe jumped to \$9.52 million (3.2% of ICI's total exports) in 1959, compared with \$16.2 million in total British chemical exports to Eastern Europe.

Company officials refuse to break down their sales figures, but they admit annual sales of polyvinyl chloride and polyethylene to Russia alone amount to several thousand tons each. Last year the largest single industrial order of Terylene ever sold went to the U.S.S.R. — 30,000 ft. of rubber-coated Terylene conveyor belting for iron ore operations.

In addition, ICI has already landed some technology sales to the Soviet bloc — a polyester fiber technology and fiber sales deal reportedly worth \$22 million with Poland, and a smaller polyester licensing deal with Czechoslovakia.

Other possible deals involving technology on some 20 products, including polyethylene, are in the conversation stage.

Although ICI officials are studiously vague about their plans, it is known they are contemplating training Russian engineers and technicians in ICI plants. They're also thinking about sending advance teams of ICI technicians to open new plants in the Soviet Union and schooling Russian engineers and workers in plant operations.

Clear Road: Unlike U.S. firms, ICI and other British companies drumming up trade with East Europe don't face a public relations problem at home. They have, in fact, the blessings and active help of their government, which believes good trade relations promotes good diplomatic relations. "American hostility [toward trading with the Communist bloc] is a mistake," ICI Chairman S. P. Chambers told a *CHEMICAL WEEK* correspondent in London last week. "Some Europeans are afraid that know-how will be used in economic warfare. We hope that we're strong enough to hold our own."

Spreading the Word: The idea for the plastics show first came up in '58 at a meeting in London between ICI officials and a Soviet trade delegation. ICI's theory was that sales to the Soviet Union could be stepped up if the scientists and technicians in Soviet institutes, factories, and regional economic councils learned what ICI had to offer — technical service as well as products.

The Soviets, who are apparently negotiating along similar lines with Italian and German companies, have shown unabashed interest in technology. Although the Soviets have done much good research work, an ICI plastics executive told *CHEMICAL WEEK*'s Moscow bureau chief last week that the Russians' development work hasn't gone much past the pilot-plant stage.

The show's reception was encouraging. At the official opening the most important men in the Soviet economy turned up, including the heads of the government's Scientific and Technical Committee and Committee on Chemistry — the men probably most influential in deciding policy on Soviet chemical technology. Some 5,000 technical people were invited officially, and many more squeezed in with the mob of excited citizens. Whether or not the show will pay off is a gamble, but ICI is optimistic.

COMPANIES

Columbian Carbon Co. (New York) has acquired principal properties and business of Ander Chemical Co. (Cincinnati) for more than \$2.5 million. Ander, a producer of printing inks, especially for packaging, will operate as a wholly owned subsidiary under present management. Columbian produces inks, carbon black and iron oxides, engages in exploration for and production of natural gas and crude oil. Its '59 sales were over \$75 million.

Varcum Chemicals Corp. (Canada), formerly a subsidiary of Varcum Chemicals Corp. (Niagara Falls, N.Y.), which was purchased last year by Reichhold Chemicals, has now been absorbed by Reichhold Chemicals (Canada). It will operate its 5-million-lbs./year phenolic molding powder plant as a wholly owned subsidiary of Reichhold's Canadian affiliate. The former parent company became Reichhold's Varcum Chemical Division in January.

Thatcher Glass Mfg. Co. (New York) reports it will acquire on July 1 all the outstanding stock of Toledo Mould Co. (Toledo, O.) in exchange for an undisclosed number of Thatcher shares. The 40-year-old producer of molds for the glass container industry will be operated as a wholly owned subsidiary of Thatcher Glass.

High Voltage Engineering Corp. (Burlington, Mass.) has completed acquisition of all the stock of Applied Radiation Corp. (Arco). Stock of the Walnut Creek, Calif., microwave linear accelerator firm was obtained at one share of HVE for every 10 1/4 shares of Arco.

EXPANSION

Phosphors, Lacquers: General Electric Co. will begin construction soon of its \$1.7-million plant addition in Cleveland to produce phosphors and lacquers. Completion is expected in early '61.

Gypsum Products: Kaiser Gypsum has exercised its option to buy a 34-acre tract near Jacksonville, Fla. A multimillion-dollar gypsum products plant is planned. Contracts are not yet awarded, but a '61 target date has been set for production.

Paper: Gaspeia Sulphite Co., subsidiary of Anglo-Newfoundland Development Co., is launching a \$10-million expansion program that includes installation of a new paper machine at its Chandler, Que., plant. Capacity of the new machine was not disclosed, but Gaspeia's sulfite pulp mill produces about 90,000 tons/year at Chandler.

Vinyl Resins: Goodyear Tire and Rubber is putting \$1 million into its Niagara Falls, N.Y., vinyl resins

plant, adding 20 million lbs./year to the plant's total capacity. The expansion will double capacity for two Goodyear specialty coating resins—Pliovic WO and AO. The new facilities are expected to be operating by early fall.

Chlorides: Diamond Alkali's Chlorinated Products Division will begin long-range expansion of its Belle, W. Va., facilities with immediate modernization of methyl chloride, methylene chloride and chloroform facilities. Engineering work also is under way for new buildings and modernized process operating equipment.

FOREIGN

Polypropylene/Japan: AviSun and Shin Nippon Chisso are in "advanced negotiations" on a polypropylene licensing agreement. AviSun would get royalties on know-how for a 20-25-million-lbs./year plant to be built by the Japanese firm. Originally, AviSun was to get equity in the venture. Another polypropylene venture will be built by Asahi-Dow, using Dow technology and a Montecatini patent.

Urea/Germany: Union Rheinische Braunkohlen Kraftstoff (Wesseling) is building a 25,000-tons/year urea plant.

Petrochemicals/Mexico: Petroleos Mexicanos (Pemex), the government's oil agency, is launching its petrochemical program of 28 plants to produce a total of 541,450 tons/year. Plants are slated for completion within two years, will include a 1,650-tons/year ammonium sulfate unit due onstream in September, an 11,500-tons/year sulfur plant, slated for production in November, and other fertilizer, synthetic rubber, and basic petrochemical plants.

Joint Ventures/India: Several Indian firms seek U.S. partners for chemical projects. Alco-Chem Ltd. (Calcutta) wants a U.S. company to pitch in know-how and some capital for a proposed 7-million-lbs./year polyethylene plant, which would use ethyl alcohol as a starting material. Andhra Sugars, Ltd. (West Godavari District, Andhra Pradesh), wants capital help for the 800,000-gal./year alcohol plant it's building. And Butto Kristo Paul & Co. (Calcutta), proprietary drug producer, wants capital for a \$500,000 expansion.

Textile, Petrochemicals/Japan: Dai-Nippon Printing Ink Co. (DPI), a Reichhold affiliate, plans to build a nonwoven fabrics plant, with Karl Freudenberg (West Germany) and Toyo Rayon. Output would be 660,000 sq.ft./year by next April, 1.3 million sq.ft. by the end of '61, 2 million sq.ft. in '62. Japan Reichhold, DPI's subsidiary, plans to build a \$7-million, 29,000-tons/year resin plant near Tokyo, will eventually make petrochemicals at the same site.

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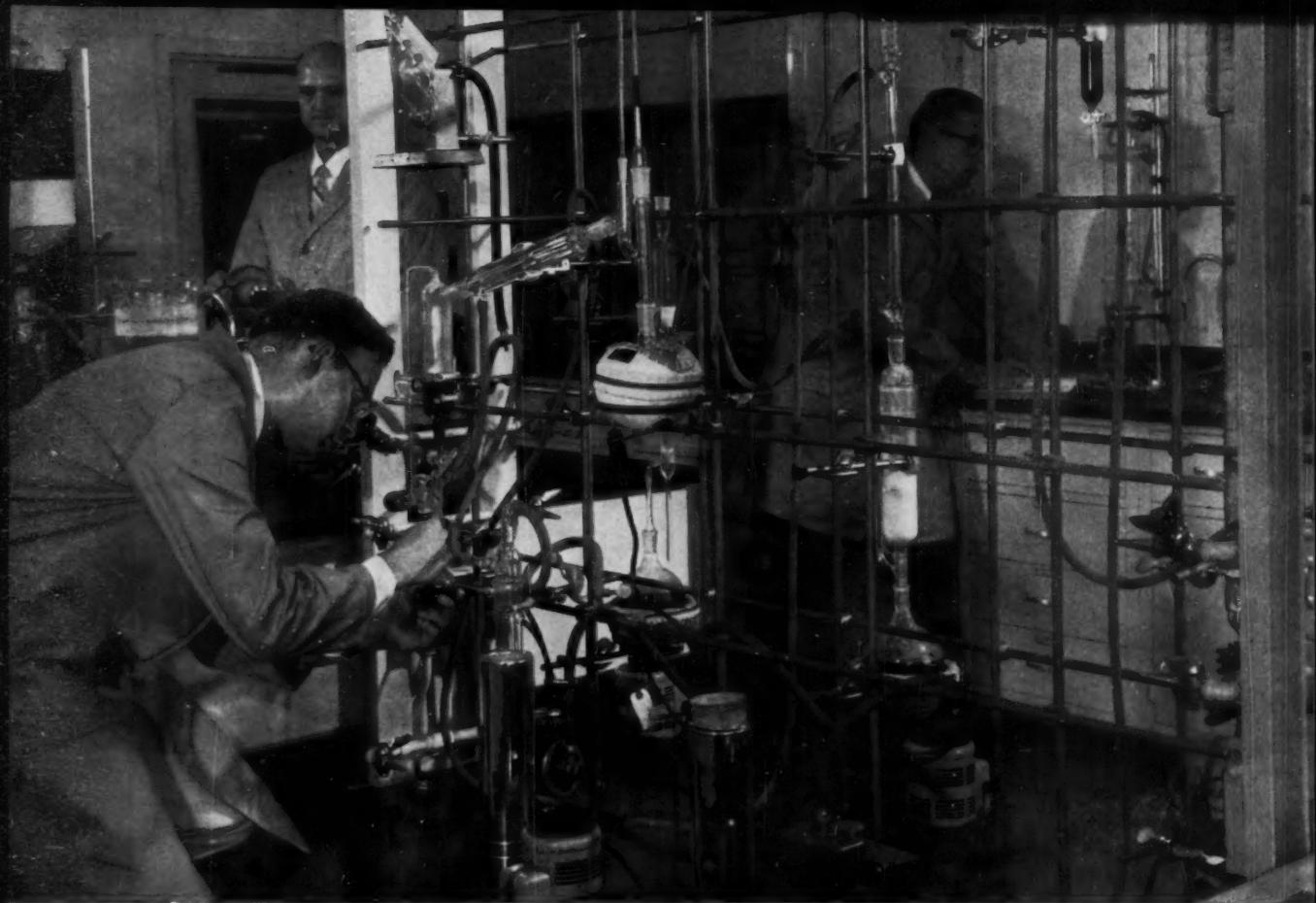
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Technical facilities were greatly enlarged and divided into four basic sections . . . Technical Service, Research, Process Development and Laboratory Service. In the last three departments, Neville scientists and technicians are constantly striving to find new polymers and chemicals to increase the ability of Neville products to improve those of its customers. In addition, these departments are concerned with the development of new processes, pilot plant studies and analytical research. Through the

efforts of this group, Neville developed the country's first commercial process for the production of high purity Indene and Indene derivatives.

The Technical Service Department spends a large measure of its time in technical assistance to our customers. Whether their products are rubber goods, coatings, floor materials, adhesives or any other, Neville studies them for application with our products and for possible improvement. The people in Technical Service pride themselves on often solving problems before customers are aware of their existence.

Neville's thirteen completely new and modern laboratory units function alike for basic research, process development, technical service, laboratory service, and isolating new chemicals or polymers. The laboratories are arranged in a continuous double line with the advanced design pilot plant

at the end. Thus, when new polymers have been discovered and studied, they subsequently proceed from one step to the next and continue down the hall to the pilot plant where the commercial feasibility of manufacture is established. In addition to this, the Quality Control Laboratories, which maintain separate quarters in the plant, are constantly at work checking to be certain that every Neville product will conform accurately to specifications.

Much of the benefit of Neville's new facilities could not be readily translated into customer profit were it not for the work of the technical representatives. These highly trained men act as liaison between your plant and the new Neville Island Center. You will find it pays to ask a member of this technical service staff to visit you and bring your formulation problem back to the laboratories for solution.



In the basic research department of Neville's new center, scientist takes a reading from a new Chromatograph to separate and determine chemical components. Not shown is an advanced new infra-red spectrophotometer for even closer identification.



Key men in translating Neville's new facilities to better service are its corps of technical representatives. One member of this highly-trained field staff is shown here assisting a customer.

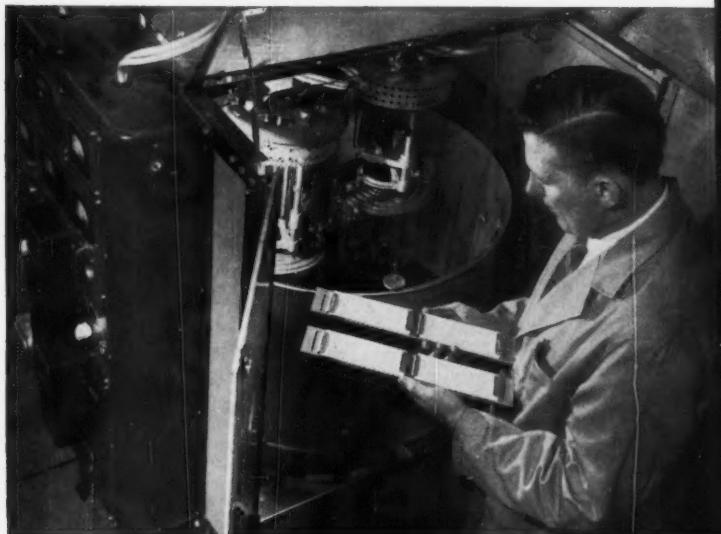
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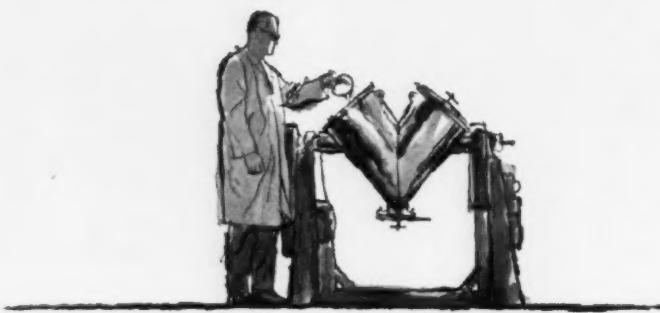
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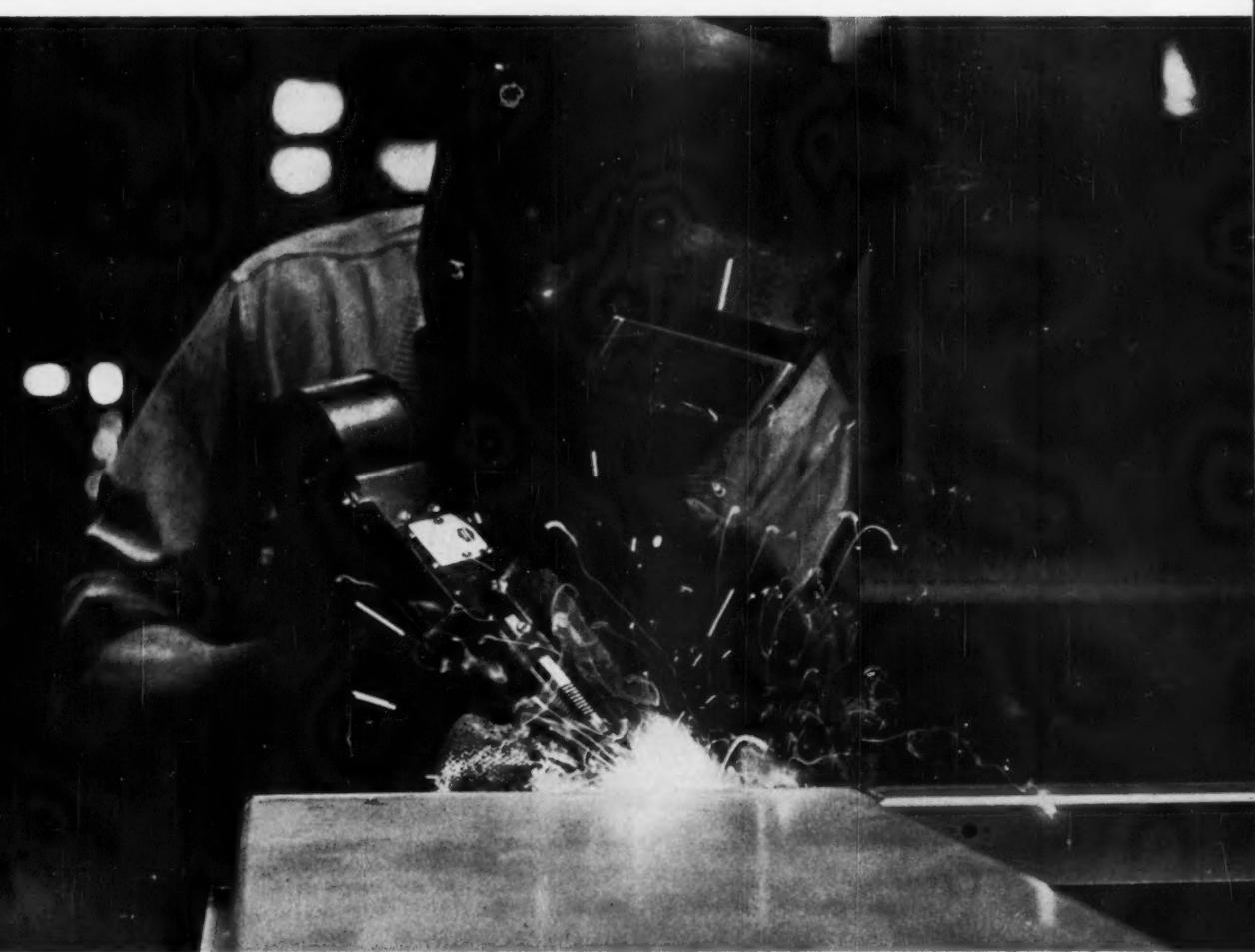
*patented and patents pending

The P-K Pre-test Laboratory is unmatched anywhere. It demonstrates things impossible to see without pilot study, works out subtle variables in blending, granulating and drying, provides scale-up data and operational procedures. We invite you to take full advantage of its facilities—either by bringing or sending your materials to East Stroudsburg. » » » You'll work with well-qualified engineers who have made thousands of resultful pre-tests for processors. They often suggest and produce unexpected product variations. Your guidance will be helpful. » » » Due to heavy lab schedule, we suggest you write or call George Sweitzer today at Stroudsburg. To call direct dial 717—Hamilton 1-7500. He will supply you with all the pertinent information regarding dates, amount of material required, shipping and travel information.

patterson-kelley

Chemical and Process Equipment Division
116 Burson Street, East Stroudsburg, Pa.

PRODUCTION



Welding with inert gas shielding may be the key to lower-cost welding techniques of the future.

Shielded Arc Welding Goes Semiautomatic

The welder shown above is using a technique that may be the key to solving one of today's growing welding problems in the chemical industry—the need for better welds at lower cost.

The basic technique, use of argon or helium to shield the weld from air to prevent brittleness, is already widely accepted for stainless steels and many of the less common metals such as aluminum, titanium and columbium.* And research is now in progress for improving the not-so-widely accepted technique of substituting lower-cost carbon dioxide for

argon and helium in the arc welding of ordinary carbon steel.

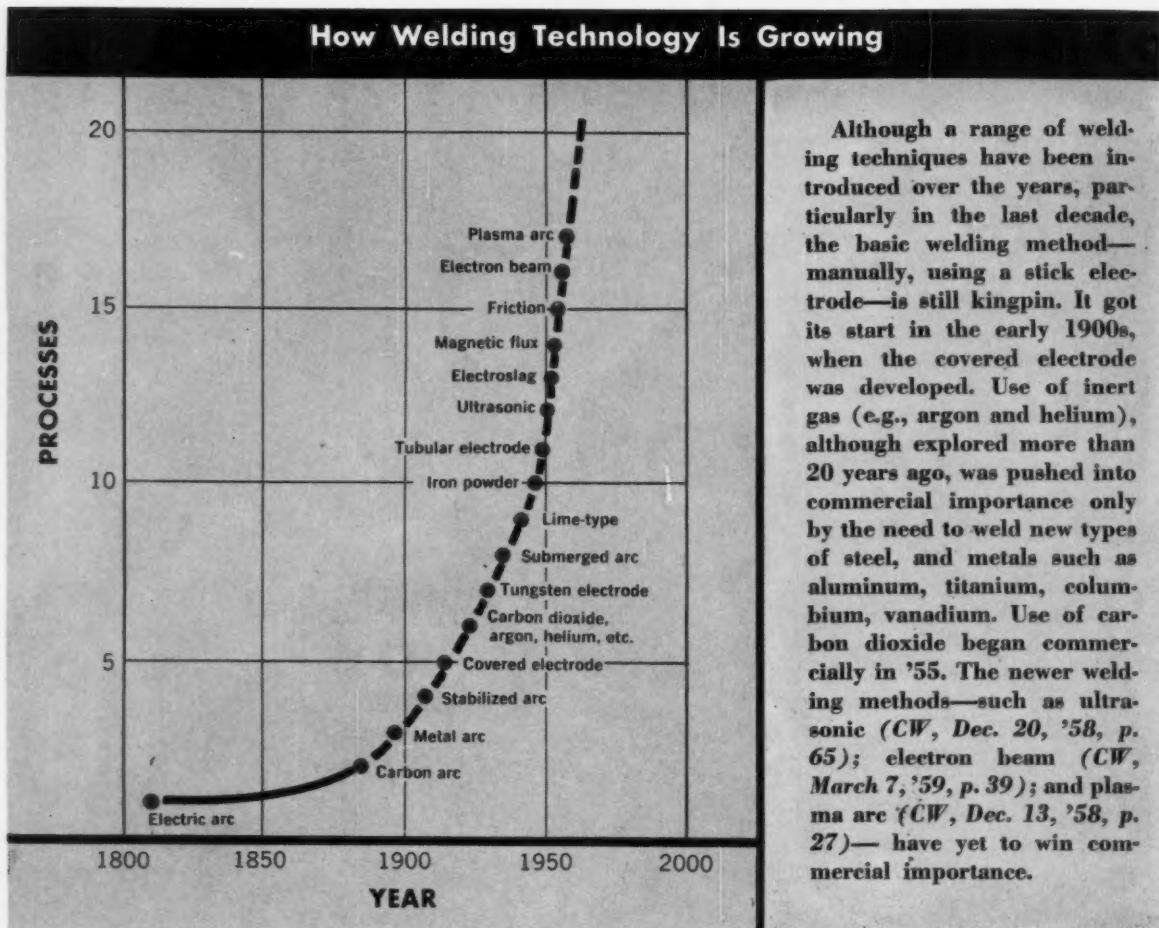
Carbon dioxide shielding has already been in use in a number of production applications (since '55). It has shown that it can cut welding time by as much as 35-50%, and cost by more than 25%, compared with manual, stick-electrode welding, which now is used for an estimated 70% of welding jobs. And good quality welds can be made by less experienced welders. For example, Modern Constructors, Inc. (Duluth, Minn.) increased weld acceptance from 80-90% (generally considered good figures) to 100%, using carbon dioxide shielding techniques for welding large

pipe sections for pipelines, refineries and power plants.

For the Future: However, as successful as carbon dioxide shielding is at present, the technology is still sketchy and only in its infancy, according to Arthur R. Lytle, senior consultant in the electric welding department at Union Carbide's Linde Co. "The process is essentially for the future—but promises well for that," said Lytle at a recent American Society for Metals conference in Birmingham, Ala.

Enlarging on this for **CHEMICAL WEEK**, he says that welding is essentially an art; and the welder has to keep his hand in to master the art. The carbon dioxide process is semi-

* The "sigma" process—for shielded, inert-gas, metal-arc.



Although a range of welding techniques have been introduced over the years, particularly in the last decade, the basic welding method—manually, using a stick electrode—is still kingpin. It got its start in the early 1900s, when the covered electrode was developed. Use of inert gas (e.g., argon and helium), although explored more than 20 years ago, was pushed into commercial importance only by the need to weld new types of steel, and metals such as aluminum, titanium, columbium, vanadium. Use of carbon dioxide began commercially in '55. The newer welding methods—such as ultrasonic (*CW*, Dec. 20, '58, p. 65); electron beam (*CW*, March 7, '59, p. 39); and plasma arc (*CW*, Dec. 13, '58, p. 27)—have yet to win commercial importance.

automatic, which theoretically should make it a less an art than manual, stick-electrode welding.

In carbon dioxide welding, the electrode wire is fed from a spool. The welder can weld continuously for many hours, compared with stick welding where the electrode is consumed every few minutes. When the welding process has to be stopped to replace the electrode, there is a chance for flaws in the weld.

The electrode is fed automatically at a speed equal to the burnoff rate. This permits a constant arc length to be more easily maintained. However, maintaining a constant, dependable feed rate for the wire isn't always simple from an equipment standpoint. For one thing most chemical plant jobs are varied, do not justify the use of complete automatic fixturing. Commonly-used hand guns must provide for wire-feed cable, welding-current cable, gas-shielding hose, electrical-control wires, and

cooling-water feed and exit. The feed wire must be pushed or pulled a distance of 10-15 ft. through a flexible tube, and feeding equipment must have sufficient tractive force to feed the wire freely and uniformly at the set control speed.

Some guns for sigma welding have wire spools set on the gun (see photo, p. 51) rather than in a container some distance away. A deciding factor: weight of the gun—its weight should not cause operator fatigue.

Although present wires are satisfactory, Lytle points out that dependable wire sources are essential, will ultimately be improved. The basic problem: deoxidizing elements. In carbon dioxide welding, the carbon dioxide acts as a shield to keep out the nitrogen and oxygen of the surrounding air, in a manner similar to argon or helium. But carbon dioxide isn't inert, dissociates at welding arc temperatures to form carbon mon-

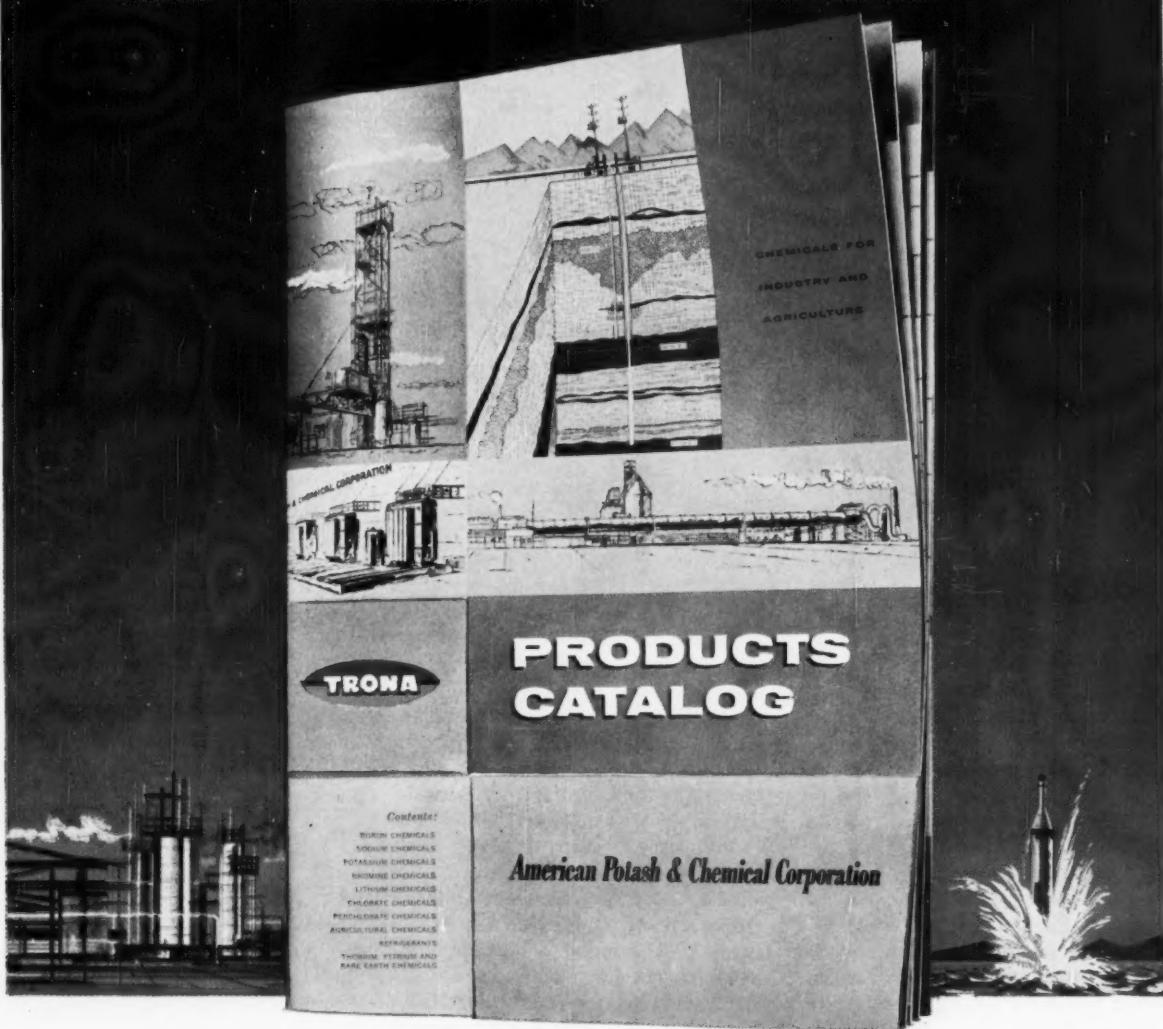
oxide and oxygen. This means that a deoxidizing element must be added to the electrode.

Still to Be Settled: Which of three systems is best? The bare-wire system uses a plain carbon dioxide atmosphere, has a special composition wire with deoxidizing and alloying elements. The flux-cored-wire system uses plain carbon dioxide, has an electrode that is tube-formed for conveying the deoxidizing, fluxing and alloying elements directly to the weld puddle. The magnetic-fluxed-wire system uses the carbon dioxide to convey the powdered elements to the bare wire where they attach themselves magnetically.

"Of course we wouldn't have to worry about the oxidation problem if argon was less expensive," says Lytle wistfully.

Argon costs, plus usage at almost double the CO_2 rate, make argon over 15 times as expensive as carbon dioxide. Helium, although less expen-

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PRODUCTION

sive than argon, is in the same general cost and usage range as argon.

Ordinary stick electrodes generate some carbon dioxide in arc atmospheres, must have deoxidizers in the coating. But long research and commercial use have helped develop the stick electrode's dependability, have made it the goal at which the carbon dioxide electrode must shoot.

The stick electrode has one shortcoming. Its coating, usually a ceramic, is somewhat porous, picks up moisture. If not baked and kept in sealed containers, the moisture will result in hydrogen in the weld deposit, give a porous weld, cause cracks. The electrodes used in carbon dioxide welding result in deposits with low hydrogen content, don't have to be baked.

Spurring Refinements: Other advantages are helping to spur continual refinements in the basic carbon dioxide welding process. Among these advantages: high weld-metal deposition rates which result in faster welding, lower costs. The arc is visible, which enables the worker to follow weld progress and make any corrections quickly.

Because of the high welding current and type of flux, the weld puddle remains fluid for some time, permitting impurities to boil out of the metal. The welds are relatively free from slag, don't have to be cleaned up after the weld pass is complete.

Arc penetration is deeper, gives greater weld strength. But it can cause problems, too. Extremely thin gauges of metal may burn through. And care must be taken in joint fit-up before welding (i.e., tolerances of the gap opening between metal joints must be controlled with greater care than that taken in ordinary manual stick-electrode welding). Another limitation: because of the gas shielding of the arc, welding can't be done in windy plant areas.

Lytle sums up the present status of carbon dioxide welding this way: "Right now the quality of manual electrode welding can't be beat, provided the welder is tops. For the average welder, carbon dioxide welding can produce more consistent results."

A few chemical plants that have tried carbon dioxide welding confirm Lytle's statement. One maintenance manager points out that one reason manual electrode welding by an ex-

pert can't be topped may be because carbon dioxide welding is still essentially an experimental tool.

Plant management isn't quick to buy anything new. For one thing, welders have to be trained in the new technique. Eventually carbon dioxide welding may simplify training of new welders. But until it is accepted as more than experimental technique, it won't have the opportunity to challenge the quality of manual electrode welding in most plants. The continued research of the major welding supply companies aimed at improving the carbon dioxide shielded processes may quickly change chemical plant management's attitude.

EQUIPMENT

Drum Heater: Glas-Col Apparatus Co. (711 Hulman St., Terre Haute, Ind.) is out with a new drum heater with pulleys and counter-balancing weights that enable one man to fit the cylindrical section of the heater over the outside of the drum. The drum is placed in the heater's portable base, the cylindrical heating section lowered over the drum. Separate thermostats in base and cylindrical sections permit temperature control to 550 F. Heater weighs 95 lbs.

Glass-Fiber Spraying Unit: Chrom-O-Lite Co. (2701 E. 78th St., Minneapolis) is offering a new trailer-mounted unit for mixing, circulating and controlling the supply materials for chopped glass-fiber spray guns. The unit has a 60-gal. mixing tank, folding boom to support hoses, cords and spray heads.

Gas-Cylinder Bracket: Central Scientific Co.'s (1700 Irving Park Rd., Chicago) new 2½-lb. cast-iron gas-cylinder bracket can be clamped to the edge of a table by two thumb screws, used to hold a cylinder temporarily in place by means of an adjustable webbed strap.

Pressure Regulator: An all-stainless-steel pressure regulator for corrosive fluids and gases is a new product of Hoke, Inc. (19 Piermont Road, Cresskill, N. Y.). Designated 640 Series, its wetted parts are made of 316 stainless, nonwetted parts of 18-8 stainless. Maximum inlet pressure:

2,000 psi.; delivery pressure: up to 125 psi.

Rectifier Junction: International Rectifier Corp.'s (1521 E. Grand Ave., El Segundo, Calif.) new Quad-Sealed junction-sealing process for silicon power rectifiers used in battery charging and industrial power applications is resistant to moisture and contaminants, permits expansion and contraction of the assembly over a wide temperature range. Output ratings: 70 to 250 amps., dc.; peak reverse voltage ratings: 50 to 600 volts. Operating temperature range: -20 to 130 C.

Gas Cleaner: The Coalescer-Demister is a new system of the Selas Corp. of America (Dresher, Pa.) for removing entrained hydrocarbons and organic liquids from compressed air and gases. The unit entrains liquids in the form of small droplets which are coalesced into larger-size droplets by porous membranes. Capacities: up to 7,000 cfm. of gas at 200 psi.

Furnace Refractory: J. H. France Refractories Co. (5110 France Rd., Snow Shoe, Pa.) is out with a new lightweight castable insulation for industrial furnaces. Called Franco Lite No. 30, the insulation weighs 31 lbs./cu. ft., is supplied in 50-lb. bags. The material is said to be as easily mixed as regular concrete, has a cold-crushing strength of 630 lbs./sq. in.; 1 in. thickness is equivalent to 7-in.-thick firebrick.

Double-Pipe Heat Exchangers: The Brown Fintube Co.'s (300 Huron St., Elyria, O.) new low-cost, double-pipe heat exchanger features improved assembly, disassembly and ease of maintenance. Tubeside connection and closure require only two ¾-in. alloy studs. Head of tube closure is locked in place with one large, forged hammer-type nut. Fintube element can be pulled straight out from shell. Shell nozzles are integral parts of shell, prevent misalignment. Standard 3-in. exchanger is for 500-600-psi. service.

Machine Mount: High-density fiberglass is the key to isolating vibration in Consolidated Kinetics Corp.'s (1065 Dublin Rd., Columbus

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LUCIDOL DIVISION



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PRODUCTION

12) new Model N machine mounts. Used where built-in level control is not required, the mounts are guaranteed not to creep. Each mount can be used for loads to 8,000 lbs.

Plastic Tubing: Penntube III is Pennsylvania Fluorocarbon Co.'s (1115 N. 38th St., Philadelphia 4) new line of clear, modified trifluoro-chloroethylene polymer "spaghetti" tubing and monofilament. Used for instrument tubing, electrical sleeving, cable sheathings and process-stream tubing, the line has good resistance to virtually all inorganic liquids and most organic solvents, is nonflammable, has good electrical properties.

Plastic Sheet: B. F. Goodrich Industrial Products Co. (Akron, O.) is out with a homogenous extruded, rigid Koroseal vinyl sheet for fabrication of chemical plant equipment. The sheet is 50-in. wide, 0.060- to 0.125-in. thick.

Alarm System: Communications and Control Division of Franklin Electronics Inc. (5901 Noble Ave., Van Nuys, Calif.) is offering an all-solid-state monitor and alarm system that is portable, will verify the condition of 30 stations with an accuracy of one part in 1,000. Permissible values for each station are punched in advance on an IBM card. When the card is inserted into the Signal Sentry, it checks each station against the values, provides audible and visual information when a station exceeds allowed tolerance. Unit requires less than 12 cu. ft. of space, less than 30 watts to operate.

Polypropylene Valves: Polypropylene gate valves are a new offering of Vanton Pump and Equipment Corp. (Hillside, N. J.). The valves will resist most solvents, greases, oils and common acids at temperatures up to 185 F. Sizes: $\frac{1}{2}$ to 2 in., with socket-weld, flanged and screwed ends. Valves are of straight-through design, are said to have close throttling control.

Bin Control: Convair (Pittsburgh 26, Pa.) is out with bin-level indicators for solving inaccuracies caused by funnelling of material. Called Flexi-Shaft, the indicators have a 4-

PRODUCTION

blade paddle that turns continuously as long as no material touches it. When material makes contact with blades, the paddle stops. Its 1/100-hp. motor continues to run, expands a torsion spring which actuates a limit switch that turns off equipment controlled by the indicator. When the material falls away from the paddle, the torsion spring reactivates the unit.

Aluminum-to-Stainless Coupling:

Project Fabrication Corp. (112-20 Fourteenth Ave., College Point 56, N. Y.) is now offering its cryogenic-plant pipe coupling for general industrial use. The coupling joins stainless-steel pipe to aluminum pipe by a metallurgical bonding process developed by Hydrocarbon Research, Inc., and PFC. The transition couplings are designed for service ratings equivalent to 3S aluminum schedule 40 pipe, are available in standard pipe sizes.

Graphite Diaphragm Valves: Falls Industries, Inc. (Aurora Rd., Solon, O.) is out with a new series of small-diameter impervious-graphite diaphragm valves. The valves have impervious-graphite body and Hills-McCanna (Saunders-type) bonnet with Teflon diaphragms. Resistant to most corrosives, the valves are also not affected by thermal shock, can be used for gases, liquids and slurries at pressures to 50 psi., temperatures to 340 F. Seven sizes to 8-in. diameter are available. Larger diameters require steel casing.

Mercury Vapor Protection: American Optical Co. (Southbridge, Mass.) is offering a new respirator cartridge for protection against vapors of elemental mercury. The cartridge is designed for use with the R-5000 series of interchangeable respirators, also offers protection against organic vapors.

High-Temperature Control: Continuous temperature control of furnaces, kilns and liquid-baths in the 1400-6000 F range is the feature of West Instrument Corp.'s (4363 W. Montrose Ave., Chicago 41) new West-Land radiation pyrometers. The units give direct temperature readings, do not require recalibration as long as target area exceeds minimum standards of instrument.



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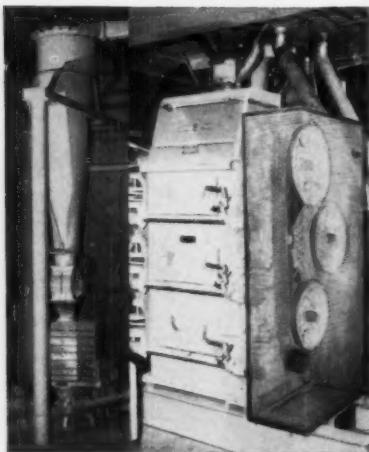
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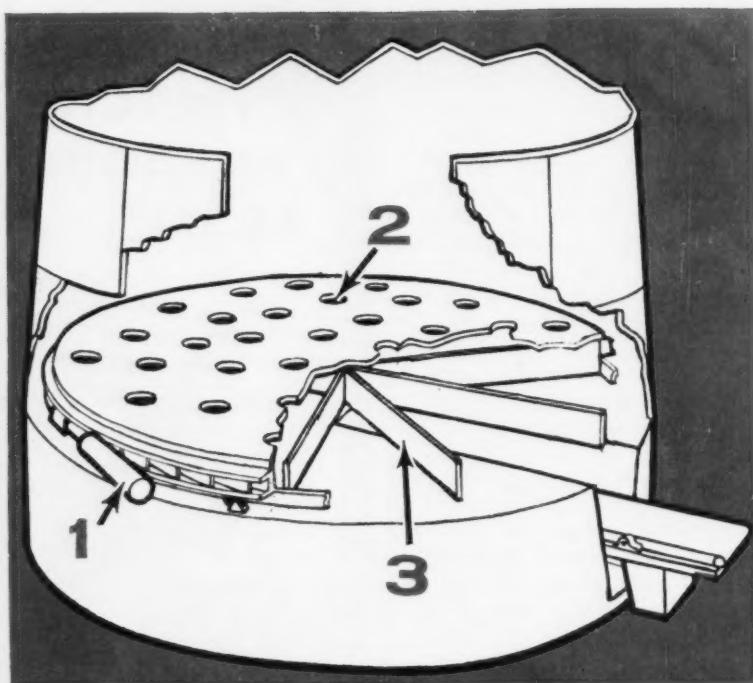
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The use of pneumatics keeps the operating area clean and pleasant while the system automatically produces the ground product at rates to 500 lbs. per hour.

For further information on the Sprout-Waldron stainless steel Gyro-Whip sifter, ask for Bulletin 153-B. Data on the three-pair high roller mill will be found in Bulletin 153-B. Complete details on Sprout-Waldron pneumatic systems are found in Bulletin 18-F.

PRODUCTION



1. Hydraulically operated cylinder pushes against pins on outer edge of turntable mounted in bottom of bin.
2. Slow movement of turntable keeps irregular-shaped solids feeding through holes in turntable.
3. Beams supporting turntable sweep solids into conveyor system in pit in floor of storage bin.

Turning the Tables on Solids

It's not glamorous, but it works—that's the way inventor Robert Jorgensen describes the bin unloader shown above. Already in operation on hogged wood waste (wood shavings and splinters from a furniture plant), the unloader is now about to be put to the test on other materials such as grain and chemicals.

Jorgensen, vice-president of Jorgensen-Bennett Mfg. Co. (a lumber firm), and Walker Wellford, Jr., president of J. E. Dilworth Co. (a heavy-mill-equipment supplier), have applied for a patent on the unloader. They've formed Jorgensen-Wellford, Inc. (P.O. Box 4776, Memphis, Tenn.) to exploit it. And, according to Wellford, firms in the area are already asking to try out the unloader on grain, ores and sulfur, in addition to wood products which are expected to make up the bulk of the market.

The unloader is nothing more than a sliding floor in the bottom of a bin, says Jorgensen. The turntable revolves slowly (about 1 revolution in 45 minutes), and the solids drop through holes and are swept into a conveyor pit by the beams that, built in the form of a wheel, support the turntable. A hydraulic cylinder, pushing from the edge, is able to develop about 75,000 psi. to keep the turntable moving.

It is the most efficient device yet developed for unloading bins of wood waste that may contain splinters varying in size from 3-in. to 2-ft. long and about $\frac{1}{4}$ -in. in diameter, says Jorgensen. Cost is about \$1 for each cu.ft. of bin storage space. Minimum size that is practical to build: about 12,000-15,000 cu.ft. with a 15-ft. diameter turntable, according to Jorgensen.

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W** SPROUT-WALDRON
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CW/110

CHEMICALS OUTLOOK

June, 1960



This news bulletin about Wyandotte Chemicals services, products, and their applications, is published to help keep you posted. Perhaps you will want to route these and subsequent facts to interested members of your organization. Additional information and trial quantities of Wyandotte products are available upon request . . . may we serve you?

NEW AMINES FROM WYANDOTTE RESEARCH

Wyandotte has added three new amines to its line of development chemicals. The new products are dimethylmorpholine, ethoxyethylamine and di-(ethoxyethyl) amine.

The dimethylmorpholine is a mixture of 70% of the 2,5 isomer and 30% of the 3,5 isomer. This product is miscible in all proportions with water and most solvents. It undergoes the same chemical reactions as morpholine, and therefore will be an important low-priced chemical intermediate for alkylation, for forming carbamates with acids and acid derivatives, and for a variety of secondary amine reactions.

The glycol ether amines possess properties of both the aliphatic and alkanol amines. Both products have boiling points similar to aliphatic amines, but their base strength is similar to the weaker alkanolamines. Ethoxyethylamine and di-(ethoxyethyl) amine are potentially low-priced chemical intermediates.

A complete list of Wyandotte amines includes: 2 methylpiperazine; 2,5 dimethylpiperazine; 2,6 dimethylpiperazine; 2 methylpyrazine; 2,5 dimethylpyrazine; 2,6 dimethylpyrazine; dimethylmorpholine; ethoxyethylamine; di-(ethoxyethyl) amine.

If you wish further data on any of these products, get in touch with us. Address your inquiry to Department C0 for prompt attention.

CaCl₂ COMPLETION FLUIDS FIND WIDE USE IN DEEP-WELL DRILLING

Deep-well drilling is a constant contest with pressure. To control it, a number of special techniques have been devised. One of these is the use of completion fluids.

Completion fluids help hold back the tremendous bottom-hole pressure in a newly drilled well before it begins producing, by filling the annular space between the tubing and the larger diameter casing.

In shallow wells with low pressures, the process is relatively simple. Clear brine, such as sea water, and solutions of sodium nitrate or sodium chloride have been used successfully for a number of years.

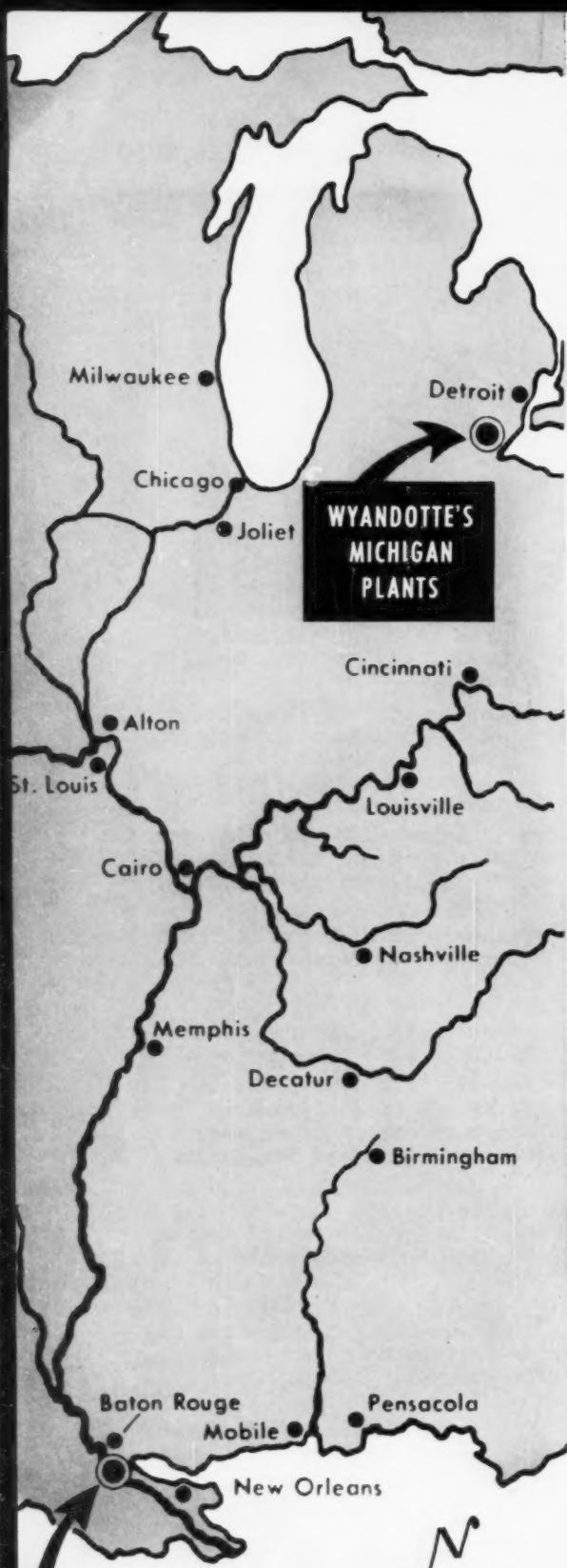
However, in deep-well drilling, the greater pressures encountered require a fluid of higher density. Calcium chloride solution has been found to work admirably, and is being used extensively in many drilling areas, particularly on the Gulf Coast.

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FROM WYANDOTTE



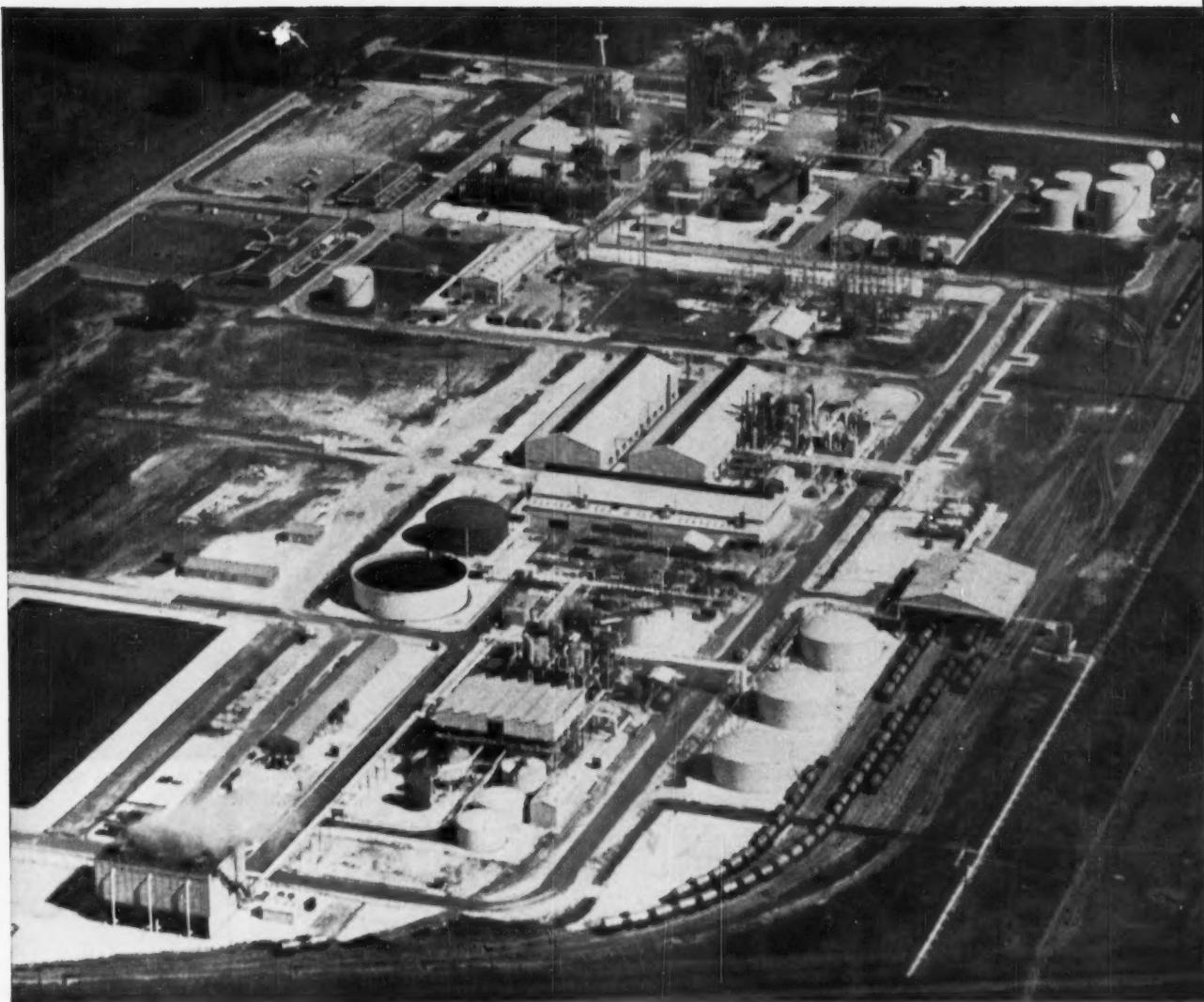
Something

Wyandotte's decision to produce chlorine and caustic in the South, as well as in the North, is proving its worth to a growing number of users of these two key chemicals. Can you benefit?

May we direct your attention to the map at the left? It illustrates an important point about our two chlorine-caustic plants. *Both are on major waterways.*

At Geismar, in the South, we are on the Mississippi . . . and close to the Gulf. At Wyandotte, in the North, we have direct access to the Great Lakes and the St. Lawrence Seaway.

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Aerial view shows Wyandotte's new, modern Geismar Works immediately south of Baton Rouge, Louisiana. The chlorine-caustic facility is in the foreground. Ethylene oxide and ethylene glycol facilities are in the background.

ventured... something gained

productive capacity of the U. S. and Canada, and you see quite readily why more and more users of chlorine and caustic are taking advantage of our ability to ship economically and with dispatch . . . by barge or

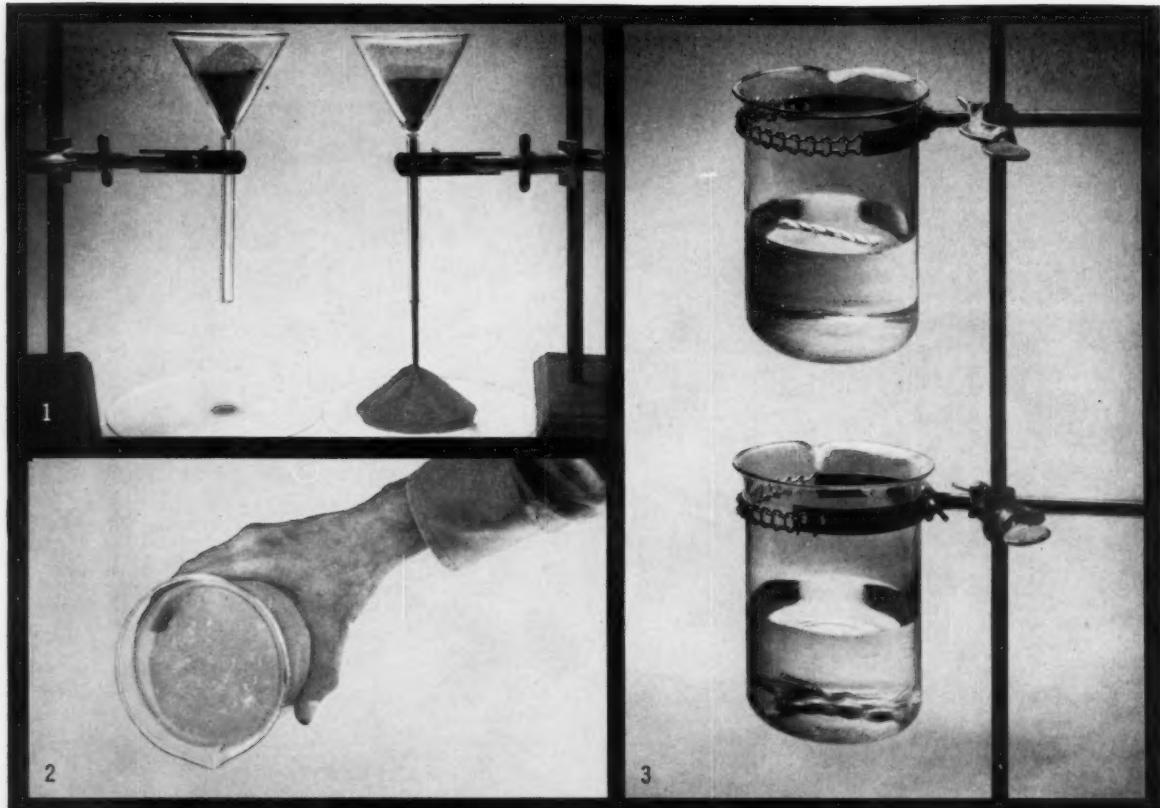
ocean tanker, truck or tank car. Can you benefit? We'd like to discuss the possibilities with you. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*



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Washington Newsletter

CHEMICAL WEEK
June 18, 1960

The Senate takes up the new defense budget this week. Despite the summit collapse and the resulting calls for stepped-up military spending, there are signs now that Congress will trim the anticipated budget boosts for the Pentagon.

Meanwhile, the lawmakers are ordering some major reshuffling in individual projects. And in all the pulling and hauling over spending plans, there will be an important impact on chemical process contractors to the military.

Contractors on the following projects will gain from budget hikes (as the Senate committee has laid out spending plans so far):

North American Aviation's B-70 bomber development (the Senate committee wants to quadruple the project's budget to \$360 million); Polaris submarines and missiles; the Bomarc-B solid-propellant antiaircraft missile (the Senate group restored funds cut out by the House); the Samos reconnaissance satellite.

So far the Senate committee has thrown cold water on proposals to jacked up the Atlas ICBM (the Air Force called for two more squadrons when the summit talks collapsed) and the Minuteman ICBM projects (the House tacked on extra funds).

Air Force is switching signals on management of weapon-system development in the ballistic missile and space fields.

From here on out, systems engineering and technical direction responsibilities on a major new project will be farmed out to one of the prime subsystem contractors, rather than to an intermediary contractor, such as Thompson Ramo Wooldridge Inc.'s Space Technology Laboratories. Normally, the systems engineering slot will go to the prime contractor whose specialty—e.g., propulsion, electronics, vehicle frame—is considered the key element of the new weapon system in question.

For the past six years, STL has been the systems engineer and technical director on the Thor, Atlas, Titan, and Minuteman missiles, and some of the first space shots. It has had vital and wide-ranging powers that have affected chemical process subcontractors and vendors: setting specs, ordering design changes, evaluating contractor proposals, supervising testing, and monitoring over-all development and production.

STL's role has stirred up considerable criticism from the system development contractors. They've complained of STL's access to their proprietary secrets, STL's advantage in being able to exploit specialized skills acquired on its unique job, and that while STL has authority for basic design and operational requirements for the ICBMs, other contractors have had the responsibility for putting the pieces together.

STL will wind up work on its present projects over the next four years, then take its place as a regular bidder for new Air Force mis-

Washington Newsletter

(Continued)

sile and space hardware development and production contracts. Right now, both STL and its parent company are barred from hardware business resulting from projects on which it is systems engineer and technical director.

Air pollution studies on auto exhaust will be stepped up somewhat as a result of a Congressional directive to the Public Health Service to produce recommendations within two years on health effects of car fumes. Since PHS has already been working on these studies, the new directive serves mostly to force it to come out publicly with whatever conclusions it will have by that time.

Cutter Laboratories has denied FTC charges of price discrimination, seeks formal dismissal of the agency's complaint. The company says competing purchasers are not charged different prices, states that any price differentials are a "good-faith meeting of competition or are justified by differences in cost."

FTC charged that a low-volume pharmacy customer pays Cutter a higher net price than competing high-volume purchasers, and that a "service retailer" customer gets a 15% price advantage over competing pharmacy customers when both place orders under \$25.

Cutter says all its pharmacy customers receive a cumulative 15% discount on invoices totaling over \$50, 7½% on \$25-\$49.99 orders, and no discount on orders under \$25. All its "service retailer" customers rate a straight 15% discount, says Cutter, on virtually all items, regardless of total volume.

Hundreds of millions of dollars in nuclear power plant construction may be held up because of a U.S. court of appeals decision last week concerning a reactor being built near Detroit.

The court ruled that AEC must certify that a reactor will operate safely before allowing construction to begin on a project. AEC practice has been to permit construction to proceed, even though safety has not been fully certified, if the company is conducting further research to ensure safety.

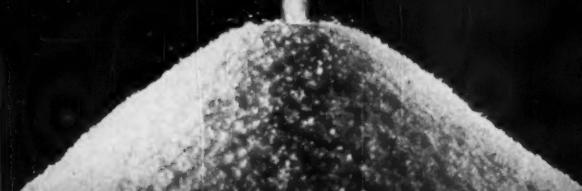
But AEC is being challenged by three labor unions, which contend that technology has not progressed far enough to ensure that working conditions are safe on such projects.

The appeals court handed down a 2-1 decision against AEC in a case involving Power Reactor Development Co.—a group of 14 public utilities and seven equipment manufacturers—to construct a "Fast breeder"-type reactor 30 miles outside Detroit.

The importance of the court ruling goes far beyond this single case, however. It could involve the future of three other reactors under construction, four more on which applications have been made as well as many additional power projects.

Source unlimited...

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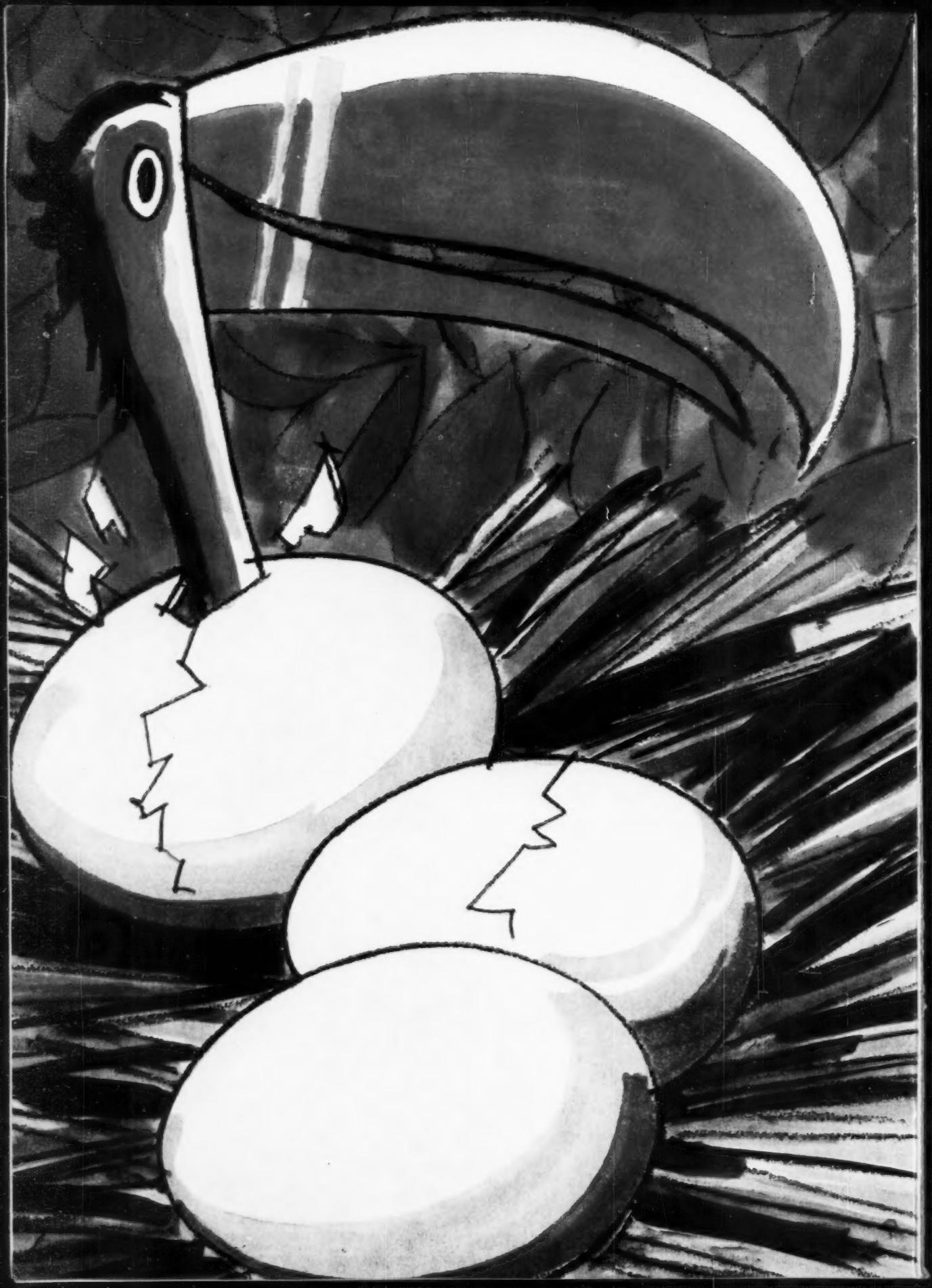


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ADMINISTRATION



Gulf Oil refinery, split by highway, lies near junction of Schuylkill and Delaware rivers.

Philadelphia's Oil Booms Chemical Growth

The sprawling tank farms of Philadelphia's mighty oil refineries these days are taking on new dimensions, both in size and in purpose. Their growth exemplifies the Quaker City's expansive metamorphosis—from large lethargic old town to bustling metropolis, from staid industrial center to fast-growing chemical supplier.

Greater Philadelphia—the city and the counties surrounding it—has prided itself for years on being a highly diversified industrial center, with no major industry dominating. But now industrial leaders agree that chemicals, paced by petrochemicals, drugs, plastics and synthetic fibers, are making the biggest thrust forward.

Capital expenditures of \$64 million

by area chemical processors in '59 put the chemical industry ahead of the petroleum and coal products industry, which had steadily held first place in expansions over the years. Between '55 and '59, chemical firms in Philadelphia's eight-county area—Pennsylvania counties of Philadelphia, Montgomery, Bucks, Chester and Delaware, and New Jersey counties of Camden, Burlington and Gloucester—chalked up a bill of \$273.6 million for new plant and equipment.

The petroleum and coal products industry added some \$333.2 million to its assets in the period; paper added \$84.3 million; stone, clay and glass operations added \$55.3 million.

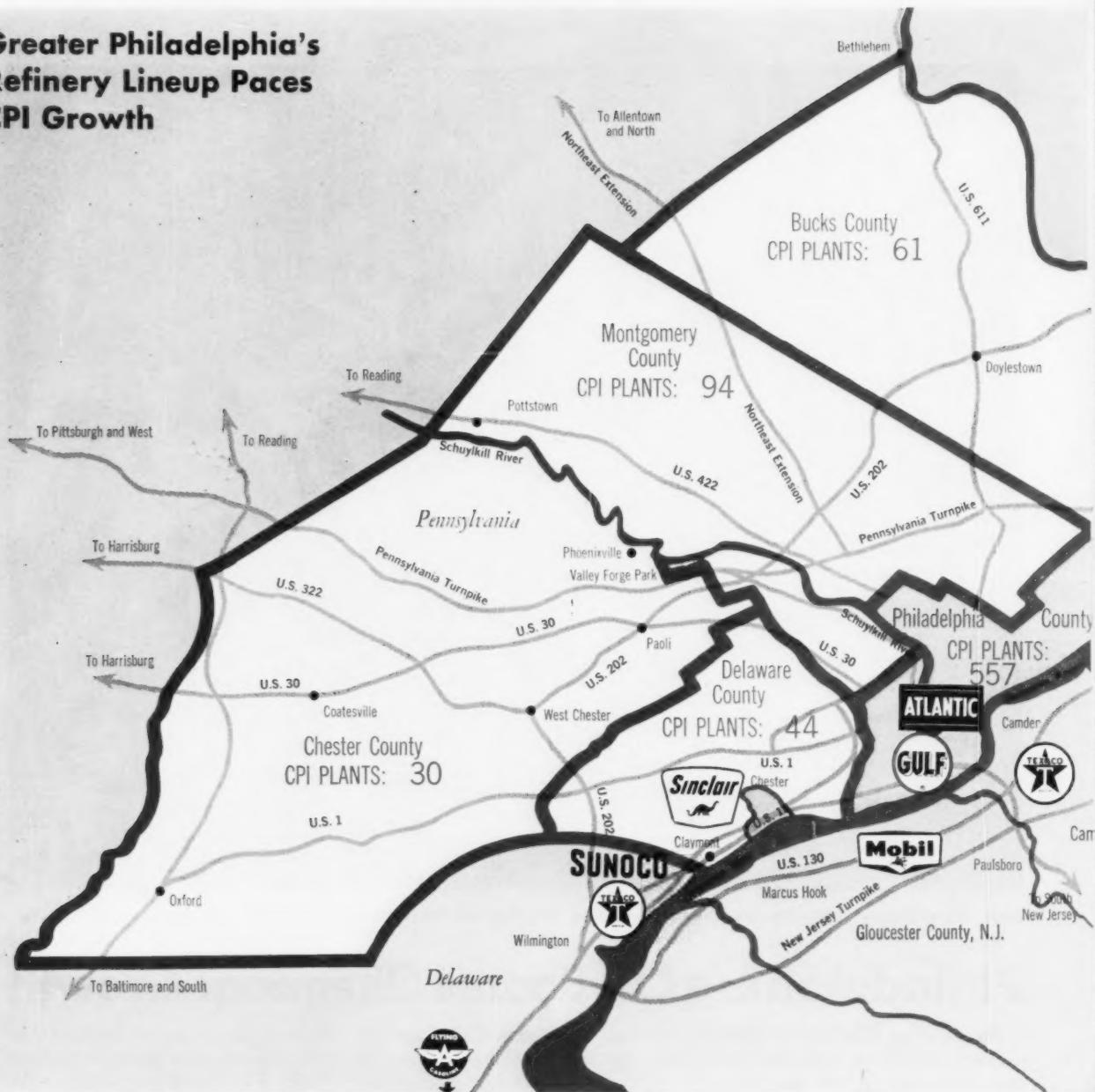
Petrochemical Outlook: But if

chemical expansion led the parade in '59, petrochemical growth in '60 and ensuing years may well dominate the scene. Petrochemical makers say that in the next five years they will put up \$130 million of new capacity at five of the seven major refineries close to Philadelphia.

Principal reason for the surging payout, say industry experts, is that new technology has brought prices of petroleum-based end-products—particularly plastics—into line with those made from natural gas.

Now Philadelphia petrochemical makers have advantages such as nearness to major markets, large-volume production experience, plenty of process water, and good river channels

Greater Philadelphia's Refinery Lineup Paces CPI Growth



to Delaware Bay and the Atlantic.

A glance at the lineup shows an impressive list of old hands in the refinery business. Seven major refineries of Gulf Oil (Philadelphia), Sun Oil (Marcus Hook, Pa.), Atlantic Refining (Philadelphia), Sinclair Oil (Marcus Hook), Mobil Oil (Paulsboro, N.J.), and Texaco (Westville, N.J., and Claymont, Del.) together have a capacity of more than 758,500 bbls./day of crude. An eighth refinery—Tidewater Oil's at Delaware City, Del.—adds at least another 120,000 bbls.

to refinery capacity within a 50-mile radius of Philadelphia, helps make it the East Coast's largest refinery area.

These companies, alone or with others are forging a strong petrochemical chain around the area. Most active has been Sun Oil. In February, Sun's new, \$2-million, 120-million-lbs./year propylene unit at Marcus Hook started production. Much of this will go to AviSun Corp. a jointly owned creation of American Viscose Corp. and Sun that will produce 20 million lbs./year of polypropylene at

Port Reading, N.J., near New York City, and 100 million lbs./year of resin at New Castle, Del. Another Sun venture, SunOlin Corp., jointly owned with Olin Mathieson, will spend \$15 million to expand ethylene capacity at North Claymont, Del., to an estimated 200 million lbs./year, using gas from Sun's Marcus Hook refinery. SunOlin and Sun Oil ethylene and propylene production are said to comprise the only large source for the high-purity olefins on the East Coast. SunOlin is also building an



Broad Spectrum of CPI Products Near Quaker City

Product Groups	Counties				
	Philadelphia	Montgomery	Delaware	Chester	Bucks
	Number of Plants				
Chemicals and petrochemicals	23	6	7	1	5
Plastic materials—synthetic resins, and non-volatizable elastomers	23	4	4	3	5
Drugs and medicines	52	4	4	1	1
Fertilizers and agricultural chemicals	7	3	0	2	0
Man-made fibers	0	0	2	0	0
Paints, varnishes and pigments	43	3	0	4	4
Soap and related products	46	2	2	0	2
Explosives and fireworks	2	1	0	0	0
Fats and oils	13	2	1	3	1
Foods and beverages	58	4	3	0	4
Leather tanning and finishing	10	0	0	0	0
Lime and cement	2	1	0	1	0
Metallurgical and metal products	69	11	5	1	4
Petroleum refining and coal products	24	5	3	1	0
Rubber products	24	11	3	2	6
Stone, clay, glass and ceramics	43	27	7	5	11
Wood, pulp, paper and board	14	4	3	6	4
Other products	61	2	4	0	2

\$8-million, 73,000-tons/year urea plant at North Claymont, Del.

Other petroleum producers aren't far behind Sun. Shell Oil's Shell Chemical is planning a \$20-million resins and plastics plant at Riverton, N.J., and Gulf Oil is building a \$10-million oxochemicals plant in southwest Philadelphia, where it already produces by-product sulfur.

Atlantic Refining, near Gulf, says it's "the largest independent manufacturer of synthetic detergents in the country." It also makes detergent

alkylates and sulfonates. Other Atlantic output includes diisobutylene, triisobutylene, cresylic acids, and anhydrous and aqueous ammonia.

Another well-known petrochemical producer, Monsanto Chemical, told CHEMICAL WEEK it has just taken a 30-day extension of its option to buy 650 acres of land near Gloucester, N.J. Local observers conclude that Monsanto will soon tell its plans for development of the site.

Petrochemical production is expected to flourish in Philadelphia in

the next several years. Sun Oil, which owns 475 acres of land on the New Jersey side of the Delaware River opposite Marcus Hook, is actively encouraging big chemical companies to come to the area.

James Harper, SunOlin president, thinks the industry has made a great "thrust forward in the last year or two and will continue to do so. All the blue-chip chemical companies have shown a very great interest in the area."

Other CPI: While petrochemical ac-

ADMINISTRATION

tivity has dominated the recent news, other CPI manufacturing has quietly developed for years near Philadelphia. In Philadelphia County and the four Pennsylvania counties around it—the major chemical producing counties of Greater Philadelphia—there are well over 700 plants turning out a full range of CPI products (see p. 71). Across the river, in New Jersey's Gloucester, Burlington and Camden counties, there are at least another 40 plants.

Some major chemical producers have chosen the five-county region for plants or for head offices. Atlantic and Sun are both headquartered in the city, along with Pennsalt Chemicals, Rohm & Haas, drugmaker Smith Kline & French, lithium producer Foote Mineral, soapmaker Fels & Co., and fiber manufacturer American Viscose.

Not far away, in Chester, Pa., giant Scott Paper has its headquarters; and in suburban Radnor, American Home Products' Wyeth Laboratories Division has executive offices. Many of these have major plants, laboratories or other facilities in and around the city.

Chemical Web: Such a list of companies and figures gives some indication of the stature of the industrial network around Philadelphia, but it offers few clues to why they're there. One major reason, of course, is the excellent harbor and shipping facilities of the Delaware River. Other reasons cited by Philadelphia boosters include the excellent transportation system, ready supply of skilled labor and professional help, availability of raw materials, proximity to industrial and consumer markets, good financial climate, and the presence of industrial, educational and cultural facilities.

The Port of Philadelphia, according to current estimates, now outranks other U.S. ports in tonnage volume of foreign commerce. It is the nation's second largest in total tonnage and is the world's largest freshwater port. It's open all year, has a 40-ft-deep channel from Delaware Bay to the Philadelphia Naval Base. U.S. Army Engineers are currently widening and deepening it northward.

Port shipments of chemicals are second only to petroleum shipments in dollar volume, according to the Delaware River Port Authority. Nearly 75% of the value of raw ma-

terials brought through the Port of Philadelphia for the nearby 11-county area is for the petroleum and chemical industries. Moreover, a similar proportion of finished products shipped by water through Philadelphia from nearby industries is from the petroleum and chemical industries.

Raw materials for chemical manufacturing received by industries in the 11 counties near Philadelphia during '57 amounted to \$112.7 million; for petroleum processing, \$768.5 million. Outshipments of chemical products were valued at \$106.9 million; of petroleum products, \$479.4 million.

Linked to the Delaware Port system are other transportation facilities that include a network of interconnected turnpikes and expressways. The latter, coupled with chemical production, is the major reason why the nation's two major liquid trucking companies are headquartered in Philadelphia. They are E. Brooke Matlack, Inc., and Chemical Tank Lines, Inc. (Downington).

Matlack's growth—from a gross of \$6 million 10 years ago to \$16.3 million last year—mirrors the growth in refinery and chemical shipments that go mainly westward to Michigan and southward to Virginia. Transportation is also facilitated by four major railroads and two air terminals.

Other Factors: Labor relations in the area, according to local sources, are considered favorable, compared with other large industrial centers. "Philadelphia has a stable labor situation," says Eli Rock, labor relations consultant to the city, "with few prolonged or bitter strikes. It has been 10 years since there was a strike at Philco or Rohm & Haas or Barrett. Many of the oil companies still have independent unions, such as at Atlantic."

Average hourly earnings of chemical workers in March, according to Pennsylvania's State Employment Service, were \$2.47. For oil and coal products, employees average hourly earnings then amounted to \$3.03. Wages in the latter industry are traditionally the highest in the area.

Of the major drug manufacturers in the area, Merck Sharp & Dohme Division of Merck, Inc., is unionized. Its production workers are members of Oil, Chemical & Atomic Workers. Other drug makers, including Smith Kline & French, Wyeth, National

Drug, McNeil Laboratories, are not unionized. An important reason why unions have been relatively unsuccessful in the area is automation, which has resulted in the hiring of fewer employees but at relatively high rates. Consequently it has reduced both the opportunity to organize and the climate for it.

Materials, Markets: Raw materials for chemical manufacturing are said to be readily available in the area. Aside from the vast array of oil derivatives, Pennsylvania has abundant natural sources of coal, iron and limestone. Moreover, high-speed transport facilities make it easy to get most other types of raw materials.

Within a 100-mile radius of Philadelphia are 500,000 business establishments and 23.5 million consumers, of better-than-average per-capita income. S. S. Johnson, vice-president of SunOlin, cites the location of the urea plant at North Claymont, Del., as "ideal to supply agricultural, dairy and beef-raising areas of the Eastern Seaboard. Also, many of the large industrial consumers of urea are within a short distance of the site."

According to Philadelphia's Chamber of Commerce, "Greater Philadelphia ranks as the second-largest concentration of business and population on the Atlantic Coast."

Outlying Area Growth: Growth has stimulated more growth. As has happened elsewhere, the overflow of people from the city to the suburbs has caused the mercantile houses to branch out, followed by manufacturing businesses. In turn, whole industrial areas, never previously considered as likely prospects, are opening up.

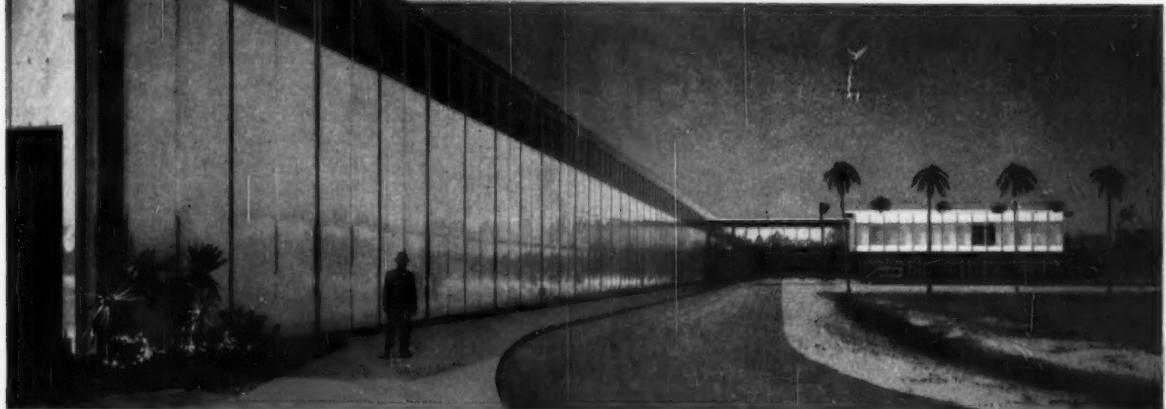
Near Philadelphia, this is particularly true in the pie-shaped wedge of communities fanning westward from the apex (at the city) to a rim 25-30 miles away. Wyeth, for example, carved a niche out of a former estate and woods in Radnor on Philadelphia's storied Main Line. Out at the fringes of Valley Forge Park, industrial development is booming, as formalized industrial parks are generated and as the high-speed highway, Schuylkill Extension, to Philadelphia has opened up transportation possibilities.

Typical of industrial parks is that of Cabot, Cabot and Forbes near Valley Forge, which has already com-

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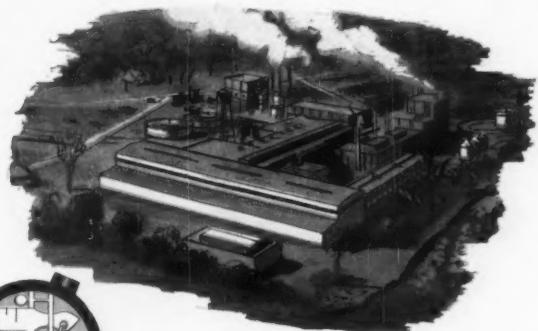
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ADMINISTRATION

mitted about 140 of its total 706 acres—50 of them to Pennsalt for its \$6-million technical service center, and three to Abbott Laboratories for a distribution and sales center. Other major industrial parks are located in Camden and Hamilton, N.J., Eddystone, Pa., Upper Dublin, Pa., Philadelphia, Pennsauken, N.J., Lower Providence, Pa.

Other organizations are hard at work selling land. All the utility companies can assemble properties of varying sizes at varying prices, with or without waterfront space. Philadelphia Electric Co. says it has 450 sites aggregating 20,000 acres; the Pennsylvania Railroad can lay claim to 2,755 acres, 350 of them on the Delaware River; The Pennsylvania-Reading Seashore Lines has 1,729 acres; the Reading Railroad has "large amounts." The nonprofit Philadelphia Industrial Development Corp., sponsored jointly by city, county and state, has access to some 1,200 acres. Land prices among these groups range from \$1,000/acre to more than \$65,000.

A major consideration to companies settling in the area is taxes. Opinions vary as to whether New Jersey or Pennsylvania taxes are higher. "Nevertheless," says Charles Omrod, who handles industrial development matters for the Pennsylvania-Reading lines, "no industry is going bankrupt due to taxation." Omrod says the major economic factor to be considered is not taxes but the cost of dredging channels to the Delaware River. This could run into "quite a few million dollars" if channels are a necessary adjunct to operations.

The city is proud of its cultural institutions, which help ensure an ample supply of qualified professional personnel. Several universities and many colleges as well as art centers thrive close by.

Outlook: Philadelphia's industrial outlook is rosy. Nearly fully recovered from the '58 recession, it is building anew, refurbishing its old foundations. On the city's perimeter, industry is developing at a startling pace. For chemical—particularly petrochemical—industries Philadelphia and its environs seem to hold fresh promise for abundant growth, either of production facilities or of offices, laboratories and distribution centers.

New Fringe Twist

In offering its employees three-year options to buy 450,000 shares of company common stock, Monsanto Chemical has put a new twist on its plan. It has assumed the role of a banker guaranteeing interest payments higher than can be earned in savings banks.

Monsanto's plan, like many others, provides a system of savings to which the company adds an increment—in this case, interest. The money saved goes toward purchase of a predetermined amount of stock.

In this plan, the second Monsanto has offered, the company will pay a minimum interest of 4% compounded semiannually on employee deposits toward stock purchase, and guarantee that interest will stay at least 1% above savings account interest rates authorized to member banks of the Federal Reserve System.

Price of the stock for employees has been set at \$39.95, equal to 95% of the average between the high and low of the stock on the New York Stock Exchange last June 3.

No Additive Alarm

A committee of health and nutrition experts appointed by Wisconsin Gov. Gaylord Nelson to study possible health hazards caused by chemical additives has reported that it can find "no scientific basis for serious alarm over the safety and quality of foods available to the American people."

The committee's report strongly underlines two shortcomings it found during its investigations; neither is laid at the chemical industry's doorstep. First, it says, the state itself has not kept pace with the increased use of chemical additives and pesticides. Its facilities and personnel are not sufficient in quantity or quality to keep up with the growing demand.

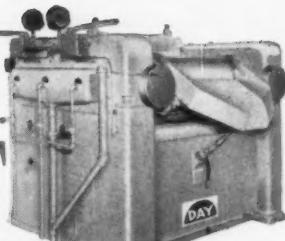
Second, the report says, the Delaney clause of the 1958 Amendment to the Federal Food, Drug and Cosmetic Act fails to take into account that "many chemicals (in food) may be hazardous in large quantities . . . but harmless under conditions which would be encountered in ordinary circumstances." The clause provides that no carcinogenic substance be permitted in food in any quantity.

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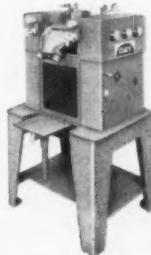
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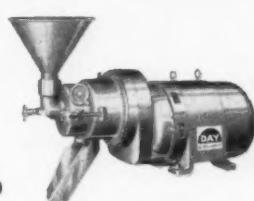
Division of The Cleveland Automatic Machine Co.

5930 Beech Street, Cincinnati 12, Ohio

MANUFACTURERS OF QUALITY MIXING, BLENDING, SIFTING, MILLING EQUIPMENT SINCE 1887

DAY HY-R-SPEED MILLS

set the pace for grinding, dispersing and blending. No skilled operator required. Complete clean-up takes less than 5 minutes. Built in three sizes: 150-300 gal. per hr.; 100-200 gal. per hr.; 10-20 gal. per hr.



DAY PONY MIXERS

assure speedy, thorough pre-mixing of vehicles and pigments. A model for every need or application—single motion and twin motion mixing action—working capacities from 3 to 125 gallons.



The J. H. DAY Co. Division of The Cleveland Automatic Machine Co.,

4928 BEECH STREET, CINCINNATI 12, OHIO

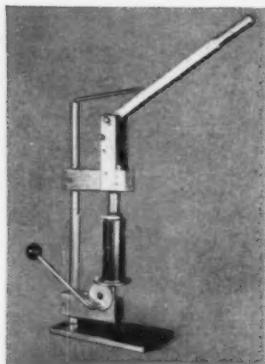
try out

Aerosol Packaging

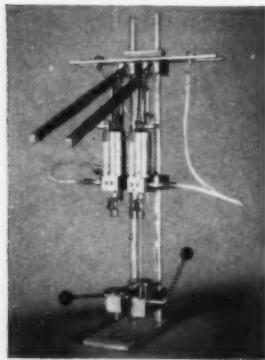
for only

\$90 a month!

**All you need
to get
started are...**



THIS Valve Crimper which seats the valve and seals the can. (Rental \$25 per month; with vacuum attachment \$37 per month.)



AND THIS Pressure Filler for injection of liquid propellant, a twin unit that lets you test any desired formulation of two propellants. (Rental \$65 per month.)

New Rental Program lets you test your own formulations, with KARTRIDG PAK laboratory equipment, in your own plant.

Thinking about an aerosol package for your product? Test it yourself under Kartridg Pak low-cost rental program!

Kartridg Pak, first in aerosols and largest builder of complete packaging lines, will rent necessary laboratory units for as little as \$90 a month.

Leading suppliers of cans, bottles, valves, and propellants will gladly cooperate in your test program.

The two manual units pictured are, in most cases, all you need. For more extensive testing, the following units are also available at these low monthly rentals (which may at any time be applied to purchase price):

- Cold Filler, \$200
- Valve Crimper for bottles, \$35
- Propellant Filler (low pressure), \$10
- Nitrogen Gasser, \$30
- Water Bath (test for leaks), \$45
- Tumble Gasser (propellant dissolver), \$105

When you decide on volume production, our engineers will advise you on the right Kartridg Pak automatic packaging machinery for your special needs.

There is a Kartridg Pak sales or service engineer in your area ready to discuss any phase of aerosol testing — or production.

ADMINISTRATION

LEGAL

Ohio 'Fair Trade': In a case filed by Helena Rubenstein, Inc. (New York), against Cinci Vitamin & Cosmetic Distributors, Inc. (Cincinnati), Cincinnati's court of common pleas last week ruled that Ohio's "fair trade" law was unconstitutional. Helena Rubenstein had requested an injunction against Cinci Vitamin forbidding sale of Rubenstein products at less than list price.

The court said that the Ohio statute unlawfully delegates police power to manufacturers, that it was enacted to correct defects in an earlier law, which was held unconstitutional by the Ohio supreme court in '58.

Popcorn Problem: The Rochester, N.Y., city chemist and Food & Drug Administration chemists are wrestling with the problem of what appears to be a safer-than-legal packing material. A fearful Rochester housewife called the city chemist when her young son ate some popcorn used as a packing material for a lamp she bought. But the child suffered no ill effects. Since the popcorn hadn't been treated and was not contaminated, the chemist's and FDA's dilemma now concerns an FDA ruling that says popcorn used as packing material "must be treated so as to preclude its use as a food."

Nudists in the Cold: Although the operator of a Riverside, Calif., nudist camp protested strongly, the Riverside county board of supervisors granted zoning to allow Grand Central Rocket Co. to manufacture and test solid rocket fuels on a 4,000-acre, California hill-country site that hemmed the camp in on three sides. The camp operator believes the presence of the rocket company would seriously impair the resort potential of his camp, but Grand Central has assured the board that it will maintain a buffer zone, screened by trees.

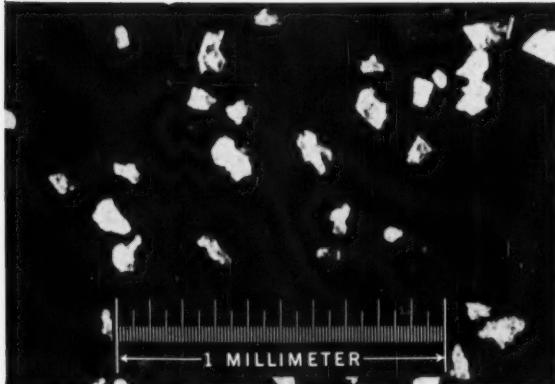
LABOR

Potash Pact: Six potash producers and four labor unions, bargaining jointly, have reached agreement on new contracts for workers at plants near Carlsbad, N.M. Two-year contracts that expire May 31, '62 call for an 8¢/hour wage increase the

THE KARTRIDG PAK CO.

Dept. W., 800 W. Central Road, Mount Prospect, Ill., Telephone CLearbrook 3-2800

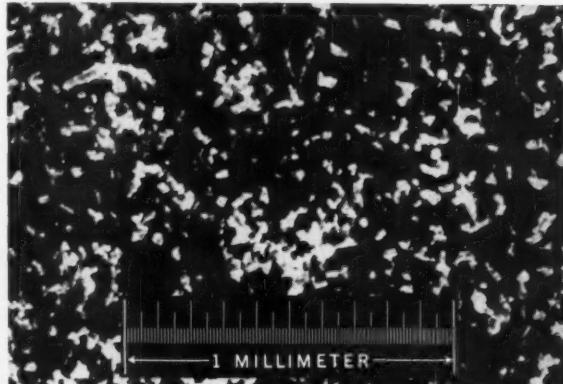
Get Sodium Bicarbonate in the
grain size you need **every time...**
FROM CHURCH & DWIGHT



Sodium Bicarbonate U.S.P. Powdered No. 1—For general purpose use in chemical processing, dyestuffs, adhesives, starches, textiles and industrial applications.

TYPICAL SCREEN ANALYSIS
CUMULATIVE PERCENT RETAINED BY

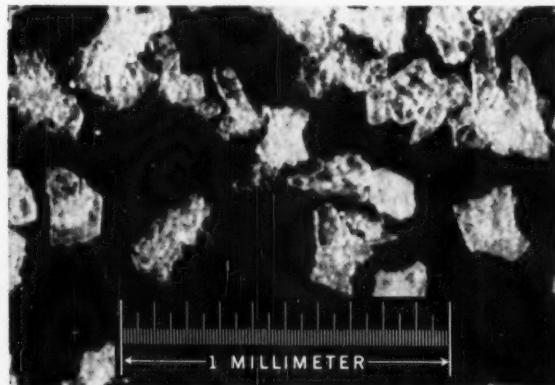
42 Mesh.....	Trace	200 Mesh.....	35.0%
100 Mesh.....	.5%	325 Mesh.....	70.0%
170 Mesh.....	20.0%	400 Mesh.....	80.0%



Sodium Bicarbonate U.S.P. Fine Powdered No. 3DF for use specifically in dry powder fire extinguisher mixes, also in rubber and plastics blowing, lubricant for sheet vinyl.

TYPICAL SCREEN ANALYSIS
CUMULATIVE PERCENT RETAINED BY

170 Mesh.....	Trace	325 Mesh.....	25.0%
200 Mesh.....	.2.0%	400 Mesh.....	45.0%



Sodium Bicarbonate U.S.P. Granular No. 5 for use in effervescent salts, other pharmaceuticals and special types of cleansers.

TYPICAL SCREEN ANALYSIS
CUMULATIVE PERCENT RETAINED BY

42 Mesh.....	Trace	100 Mesh.....	.92.5%
65 Mesh.....	.27.0%	170 Mesh.....	.99.0%
80 Mesh.....	.66.5%		



Sodium Bicarbonate U.S.P. Treated Free-Flowing for use in fire extinguishers and sponge rubber.

TYPICAL SCREEN ANALYSIS
CUMULATIVE PERCENT RETAINED BY

42 Mesh.....	Trace	200 Mesh.....	35.0%
100 Mesh.....	.5%	325 Mesh.....	70.0%
170 Mesh.....	20.0%	400 Mesh.....	80.0%

Are you getting sodium bicarbonate of the specific grain size for optimum results in your process or for maximum shelf life and performance of your products? You can eliminate doubts by specifying Church & Dwight. This simple step will assure you of obtaining the widest selection of grain sizes available because Church & Dwight is the country's largest supplier of Sodium Bicarbonate U.S.P. You'll also receive for the asking unmatched technical service based on more than 100 years of experience with sodium bicarbonate. Unusual grain size requirements are given special attention. Try us and see.

CHURCH & DWIGHT CO., INC., 70 PINE STREET, NEW YORK 5, N.Y.

YOU MAKE ANY OF THESE PRODUCTS WILLIAMS CAN HELP YOU WITH THE PROBLEMS OF PROPER PIGMENT- ATION

- ASBESTOS SHINGLES
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We have a background of over 82 years in helping leading manufacturers with their problems of proper application of Iron Oxide pigments to finished product. If you have a problem, call upon our research and development facilities. Here you'll find "Pigment Technology at its Best." As you see, almost every kind of industry involved with proper use of Iron Oxide pigments has called upon us. Why don't you? See your Williams representative . . . or address Dept. 39, C. K. Williams & Co., 640 N. 13th St., Easton, Pa.

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"Pigment Technology at its best"

C. K. WILLIAMS & CO. • E. ST. LOUIS, ILL. • EASTON, PA. • EMERYVILLE, CAL.

ADMINISTRATION

first year and 9¢/hour the second. Unions are the Stone and Allied Products Workers, the International Machinists, the Operating Engineers, and the Boilermakers. Companies are U.S. Borax & Chemical, International Minerals & Chemical, Potash Co. of America, Duval Sulphur & Potash Co., Southwest Potash Co., and National Potash Co.

Among the fringe benefit improvements is the conversion of production bonuses into fixed base pay, with each company having the option to negotiate a continuation of the present bonus system or the institution of a new one. Other changes affect shift premiums, time off with pay, workmen's compensation, and vacation plans.

Dow Contract: A three-year contract, expiring May 31, '63, has been agreed on by management of the Freeport, Tex., facilities of Dow Chemical and Ethyl-Dow, and the Metal Trades Council and Operating Engineers, both of the AFL-CIO. The contract, which covers 3,300 employees, calls for an 8¢/hour wage increase effective immediately, 5¢/hour on Dec. 1, an additional 6¢ on June 1, '61 and 9¢ on June 1, '62. Other changes include revised seniority provisions and a new sick-leave plan.

Carbide Pact: Union Carbide Chemicals Co. and Local 15-58, Oil, Chemical & Atomic Workers Union, have agreed on a general 7¢/hour wage increase for 134 production and maintenance workers at the company's Niagara Falls, N.Y., plant. The two-year contract calling for a wage-reopener in one year, also calls for increases in shift differentials and adjustment of most job rates.

Canadian Paper: Latest companies to follow the patterns being set in pulp and paper settlements—averaging 17¢-18¢/hour in wage increases—in western Canada are St. Lawrence Corp., Anglo-Canadian Pulp & Paper Mills, Ltd., James Maclaren Co. and Bowaters-Mersey Paper Co. They've signed contracts with Pulp and Sulphite Workers extending from May 1, '60 to April 30, '61. Virtually all the rest of the companies in eastern and central Canada are expected to have negotiated new contracts by the end of June.

Another new development using

B.F.Goodrich Chemical raw materials



Mc Ness Waterless Hand Cleaner made with Carbopol 934 by Furst-Mc Ness Company, Freeport, Ill., is being sold to farmers, mechanics, and householders. B.F.Goodrich Chemical Company supplies the Carbopol 934.

New waterless hand cleaner is emulsified with Carbopol 934

This cream-type waterless hand cleaner employs Carbopol 934 water-soluble resin to blend a number of ingredients with water. It will remove grease and grime—even tar or paint—and leave hands feeling soft and smooth. Since this cleaner may be used in areas where temperatures are high—or cold, resistance provided by Carbopol to viscosity changes or emulsion breakdown is important.

The manufacturer cites other advantages of Carbopol too: the

excellent suspending and emulsifying properties allow development of a quick breaking emulsion with good stability. Viscosity can be high with low concentration—and there is no rubbery feel. The wide choice of neutralizing agents provides versatility of formulation. Finally, the ease of processing cold simplifies manufacturing problems and increases production.

Here's another way Carbopol 934 is improving a product—or opening new markets. To get more informa-

tion or samples, write Dept. JB-2, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

Carbopol
Water-Soluble Resins

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich

GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

NALCAMINE® G-39M

...This low cost fatty diamine makes high quality corrosion inhibitors!

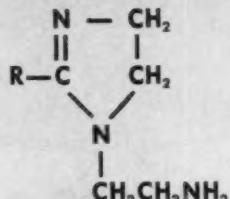
Here's

Why!

- It is strongly adsorbed on metallic surfaces . . . Contains two cationic centers, making it a really powerful surface active agent.
- It is readily pourable, for easiest handling.
- It exhibits excellent stability in corrosive environments.
- It is soluble in hydrocarbons . . . as the free diamine or as its salts of high molecular weight acids.
- It makes normally water-accepting surfaces oil wettable.
- It can be alkylated, oxyalkylated, quaternized or converted to salts of acids by neutralization.

Nalcamine G-39M has been designed expressly for use in products where pharmaceutical purity and color are not required. Thus it offers you all these important properties for a top corrosion inhibitor at a really *down to earth cost!*

THIS IS NALCAMINE® G-39M



Nalcamine G-39M is a mixture of diamino imidazolines, consisting predominantly of the diamine shown above where the mixed alkyl chains are heptadecenyl and heptadecadienyl.

TYPICAL ANALYSIS

Apparent Molecular Wt.	422
Apparent Combining Wt.	211
% Imidazoline	94.0
% Titratable	99.2
Spec. Gravity at 60°F.	0.948
Pour Point °F.	25
Viscosity at 60°F. cps	334
Density—Lbs. per gallon	7.91
Color	Black

SHIPPING

Nalcamine G-39M is shipped in fifty-four gallon, bung, unlined, non-returnable steel drums. Weight of each drum is approximately 420 lbs.

HANDLING

Nalcamine G-39M can be handled or stored in iron or mild steel. It should be stored in a closed container.

NALCO CHEMICAL COMPANY

6185 West 66th Place

Chicago 38, Illinois

Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany

In Canada—Alchem Limited, Burlington, Ontario

...Serving Industry through Practical Applied Science

Nalco
CHEMICALS

ADMINISTRATION

KEY CHANGES

Herman C. Nolen to board of directors, B. F. Goodrich Co. (Cleveland).

James W. Evans to board of directors, American Maize-Products Co. (New York).

Robert M. Hainsfurther to vice-president, production, and William C. Oberlin to chief engineer, Glass Division, Pittsburgh Plate Glass Co. (Pittsburgh).

Joseph W. Selden to vice-president, Chemical Division, Minnesota Mining and Manufacturing Co. (St. Paul).

Donald W. Champlin to vice-president, engineering and planning, Winchester-Western Division, Olin Mathieson Chemical Corp. (New York).

Charles D. Harrington to vice-president, Mallinckrodt Nuclear Corp., subsidiary of Mallinckrodt Chemical Works (St. Louis).

William P. Hagenbach to director, engineering research, A. E. Staley Manufacturing Co. (Decatur, Ill.).

R. J. Boushka to general sales manager, Chemicals Division, Vickers Petroleum Co., Inc. (Wichita, Kan.).

Johnstone S. Mackay to director, research and development department, Pittsburgh Chemical Co. (Pittsburgh).

Robert W. Ward to president, Sydney M. Cone, Jr., to vice-president, newly organized Olympic Chemical Co. (Greensboro, N.C.).

Gustave A. Bleyle to vice-president, engineering, Santa Monica office, Arthur D. Little, Inc. (Cambridge, Mass.).

E. H. Hermsen to corporate secretary, Tidewater Oil Co. (Los Angeles).

DIED

Edgar C. B. Kirsopp, 67, president, Southern Resin and Chemical Co., and a director of Rohm & Haas Chemical Co. and National Drug Co. and chairman of the board of Carter Paper Co., in Pebble Beach, Calif.

Harold C. DeLong, 79, retired vice-president, Gum Products, Inc., in Boston.

ALLIED CHEMICAL

from

Allied
Chemical

- better polyesters from
pure phthalic anhydride
- sulfuric acid services expanded
- new high molecular polyethylene
- low-cost oxidizer for industry

- *Allied Chemical Phthalic Anhydride produces fast cure polyester with superior color retention*



Photomicrograph of phthalic anhydride crystallized from liquid state in calorimetric freezing point tests.



Faster cure, better color retention, resistance to cracking and crazing, toughness, low color, low shrinkage during cure, good weathering, low peak exotherm—these are a few of the advantages manufacturers of reinforced polyester products gain when the resin is made with pure Allied Chemical Phthalic Anhydride.

Many of these advantages stem from the fact that the purity of Allied Chemical Phthalic is maintained at 99.7 mole per cent minimum. This level is established by Plastics and Coal Chemicals Division researchers, through the calorimetric freezing point determination method, as the effective minimum purity standard—the limit at which impurities have no effect on processes and end products. And Allied Chemical is a basic supplier of two other essential polyester intermediates, Maleic Anhydride and Fumaric Acid. Write for further information.

■ **PLASTICS AND COAL CHEMICALS DIVISION**



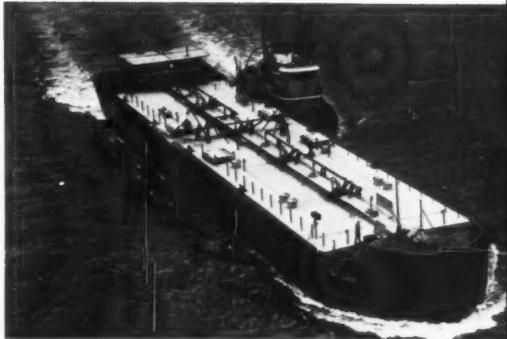
Light-weight, reinforced glass-fiber boats like this are better made with Allied Chemical Phthalic Anhydride-derived polyester resin.

- *How Allied Chemical expands customer service through progress in sulfuric acid*



Our General Chemical Division is one of industry's primary sources of Sulfuric Acid. It maintains this position through continued progress in research, production and distribution. Each photo on these pages is an example of General's current progress in Sulfuric Acid...the kind of progress that means expanded service for our customers. Each is another reason why—"When it comes to Sulfuric Acid, it's wise to Come To Allied Chemical!" ■ **GENERAL CHEMICAL DIVISION**

◀ **Expanded service through production...** General Chemical now has a coast-to-coast network of 21 sulfuric acid plants. Latest additions are its Elizabeth, N. J., Works on the east coast (shown at left) and its Anacortes, Wash., Works on the west coast. Both built to supply new and growing industrial needs in these areas.

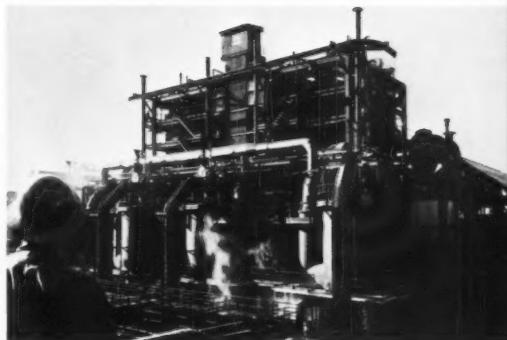


Expanded service through distribution... Recently General Chemical launched the twelfth of its sulfuric acid barges, another addition to the nation's largest fleet serving customers on inland and coastal waterways.

Over 500 company-owned tank cars deliver sulfuric acid by rail to company customers in every corner of the country. In the past two years, almost 200 cars have been added to this huge fleet.



◀ **Expanded service through spent acid handling...** Major headache of many sulfuric users is disposal of spent acid. To help solve customers' problems, General now has complete spent acid handling and recovery facilities at 15 of its plants. Facilities at its Delaware Works and several other plants have been adapted in recent years to produce sulfuric by decomposition of spent acid as well as from virgin sulfur or pyrite ore.



◀ **Expanded service through sulfur recovery...** Recovery of sulfur from exit gases of refineries and many other industries not only helps solve air pollution problems but turns economic loss into an asset. General's new Bayway, N. J., recovery plant, especially built for this purpose, is one of several company operations so equipped to serve "neighbor" customers.



- *Tests show bright future for new,
very high molecular weight polyethylene*



A new 1,000,000 plus molecular weight polyethylene that contributes high impact strength, flexibility, tear resistance, stress cracking resistance and many other desirable properties, has been developed by Allied Chemical's intensive high polymer research.

Called A-C Polyethylene X, this new material is shown in the Bell stress test above. Results indicate that as little as 2% of this new resin added to conventional polyethylene rated at F_{50} one-half hour, has increased the F_{50} to greater than 200 hours. Compression molded 100% A-C Polyethylene X shows "no stress failures at any time" in the Bell test. Ask your technical people to evaluate A-C Polyethylene X in the development of your product.

■ SEMET-SOLVAY PETROCHEMICAL DIVISION

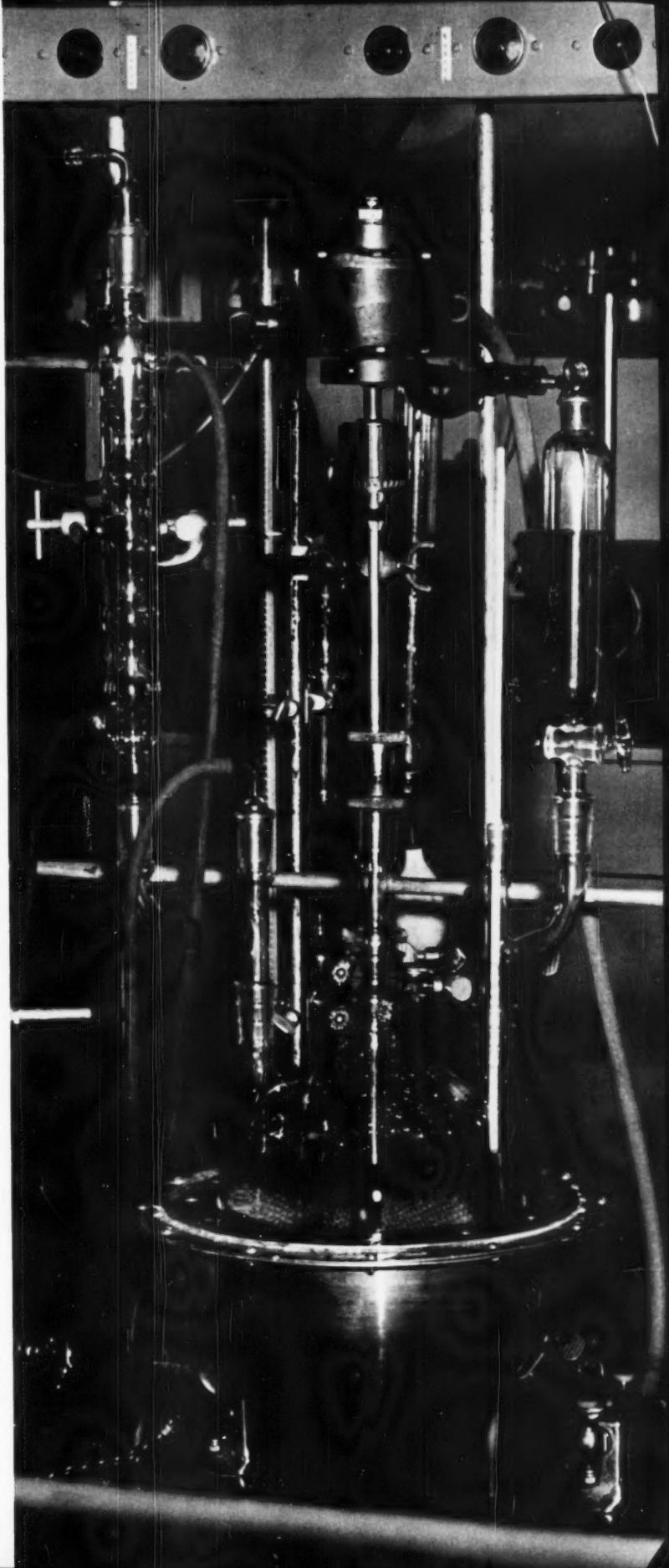
• *Versatile
rocket fuel oxidizer
stars in new role
... as low-cost
oxidizer for industry*

A little-known, low-cost oxidizer
—Allied Chemical Nitrogen
Tetroxide—is finding many new
applications in industry. Now used
as a rocket fuel oxidizer, it can
serve equally well in industry as an
oxidizer over a broad range of
reaction rates—from the slow
rates for metal recovery and fuel
purification to the rapid rates
required for explosives.

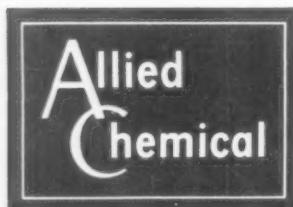
With or without solvents and at
low temperatures, N_2O_4 can react
with olefins to form various types
of adducts, such as dinitro and
nitroso-nitrate derivatives. Selective
oxidation reactions usually
carried out at higher temperatures
can be accomplished with
either N_2O_4 or gaseous NO_2 .

The versatility of this low-cost oxidant
holds promise in many fields.
If you are looking for a low-cost
oxidizer, investigate the
potentialities of Allied Chemical
Nitrogen Tetroxide.

■ **NITROGEN DIVISION**



- basic to America's progress



For more information, write
Allied Chemical Corporation, Dept. 50-CA
61 Broadway, New York 6, New York.

In Canada:
Allied Chemical Canada, Ltd.,
1450 City Councillors Street, Montreal

- principal products for industry

BARRETT DIVISION—prepared roofing; built-up roofing; fibreboard, gypsum and other building products; paving materials, including bituminous liquids, bituminous concrete and aggregates.

GENERAL CHEMICAL DIVISION—sulfuric and other commercial acids, alums, phosphates, fluorine and sodium compounds; BAKER & ADAMSON reagents and fine chemicals; GENETRON refrigerants and aerosol propellants; agricultural insecticides, fungicides, weed killers and specialties.

INTERNATIONAL DIVISION—selling Allied Chemical products for export markets.

NATIONAL ANILINE DIVISION—NATIONAL dyes and certified colors; HARMON COLORS (organic pigments); NACCONOL detergents, organic chemicals and intermediates, pharmaceutical chemicals; NACCONATE diisocyanates for urethane products; CAPROLAN polyamide fiber.

NITROGEN DIVISION—ARCADIAN fertilizers, nitrogen solutions; PROCADIAN feed mixtures, ammonia, urea, ethylene oxide, ethylene glycols, ethanolamines.

PLASTICS AND COAL CHEMICALS DIVISION—coal-tar chemicals; PLASKON molding compounds, industrial and coating resins; industrial tar products including creosote oils, pitches, coatings, pipeline enamels.

SEMET-SOLVAY DIVISION—A-C polyethylenes; coke and by-products; WILPUTTE by-product coke ovens and coal chemicals plants and engineering services.

SOLVAY PROCESS DIVISION—soda ash, caustic soda, potassium carbonate, caustic potash, chlorine, chloromethanes and benzenes, hydrogen peroxide; calcium, aluminum, ammonium chlorides; cleaning compounds; vinyl chloride; MUTUAL chromates.

SPECIALTIES



Slated for fine-chemicals production, after renovation, is 100,000-sq.ft. plant acquired by Hoechst.

Hoechst Looms Larger in U.S. Chemicals

Intercontinental Chemical Corp. (New York), the holding company for Farbwerke Hoechst's U.S. operation, disclosed this week that it is negotiating to buy a small U.S. drug firm, which reportedly has sales in the \$5-10-million/year range.

This is the latest in a series of maneuvers, beginning in '53, by which Hoechst has quietly managed to capture a sizable chunk—CHEMICAL WEEK estimates \$20 million—of U.S. chemical sales.

The move comes on the heels of a number of other deals recently completed here by Intercontinental:

- Purchase in January, for \$175,000, of a 27-acre plot from Millburn

Mills in West Warwick, R.I. This land—which includes a textile mill having 100,000 sq.ft. of space—is situated next to 19 acres on which Hoechst Chemical Corp., another subsidiary, is turning out a variety of chemicals in six buildings (four new, two old).

- Purchase of a major share in Engelhard Industries' Azoplate Corp. (Murray Hill, N.J.), producer of presensitized litho offset plates and related products. This gives Hoechst a strong U.S. outlet for photocopying products made by Kalle & Co. AG. (Wiesbaden-Biebrich, Germany), one of its German subsidiary companies.

- Purchase of a 50% share in

Hoechst's U.S. Timetable

1953	Intercontinental Chemical Corp. set up as U.S. holding company in April. All capital stock of Progressive Color & Chemical acquired in August.
1954	Majority interest in Metro Dyestuff Corp. (West Warwick, R.I.) acquired in April.
1957	Majority interest acquired in Carbic Color & Chemical in January. Metro renamed Hoechst Chemical; all outstanding stock acquired in March.
1958	Hoechst Pharmaceuticals formed "for market study investigations" in October. Hostawax Co. named as division of Progressive Color & Chemical.
1959	Uhde Corp. renamed Hoechst Uhde in April. Progressive Color & Chemical renamed Hostachem Corp. in May. Carbic Color & Chemical renamed Carbic-Hoechst Corp. in July.
1960	Major share in Azoplate Corp. purchased from Engelhard in January. Westco Chemicals partly acquired and Hostachem Corp. group set up in January. Additional land and buildings purchased adjacent to Warwick R.I., operation in February. Headquarters Carbic-Hoechst, Hostachem and Hostawax moved to Mountainside, N.J., in July.

Westco Chemicals (North Hollywood, Calif.) and establishment within that organization of Hostachem Corp. to handle Western sales and distribution of products made by Farbwerke Hoechst's U.S. and German operations—except products handled by Carbic-Hoechst, an Intercontinental subsidiary, which Westco will continue to sell.

In addition, Hoechst is also setting up a new sales office for the Hostachem group in Chicago this month.

And there's intracompany activity currently under way. In the next few weeks, for instance, Intercontinental will move three of its subsidiary operations to a newly erected

SPECIALTIES

40,000-sq.ft. building in Mountainside, N.J. Making the move will be Carbic-Hoechst Corp., which sells dyestuffs, pigments and textile chemicals; Hostachem Corp., which handles sales of industrial and pharmaceutical chemicals, plastic films and synthetic fibers; and Hostawax Co., which handles sales of Hoechst waxes in the U.S. Also moving to Mountainside is the accounting department of Intercontinental.

The executive offices of Intercontinental — along with Hoechst Pharmaceuticals, another subsidiary, will remain in the Empire State Building in New York City.

Name Dropping: The rapid growth of Hoechst in the U.S. may have escaped the attention of many in the chemical industry. Until last year, most of the Hoechst operations did not carry the Hoechst name. In '59, however, a number of companies were renamed to more closely identify them with their parent.

Uhde Corp., a process licensing arm of Hoechst, became Hoechst Uhde in April; Progressive Color & Chemical became Hostachem Corp. in May; and Carbic Color & Chemical became Carbic-Hoechst in July. This incorporating of the Hoechst name in subsidiary operations in the U.S. follows a pattern Hoechst has followed earlier in other countries. In Canada, for instance, Hoechst set up Trans Canada in '51, changed it to Hoechst Industries Ltd. in '56. And in Mexico, the former Farmacolor S.A. later was changed to Quimica Hoechst de Mexico S.A.

Started in '53: Hoechst began its postwar U.S. career in '53, when Intercontinental Chemical Corp. was incorporated in New York as a holding company. Heading this operation as president is Max Klee, a German-born, former I. G. Farben man. Two General Aniline alumni, E. P. Sommer, vice-president, and Willi F. Johannsen, secretary and treasurer, and an ex-Bayer man, L. C. Balling, vice-president, make up the U.S. management team for the holding group. Klee, after serving on the executive board of Knapsack-Griesheim AG., a Farwerke Hoechst subsidiary, was sent to Canada in '51 to set up Trans Canada Chemicals as a holding company for Hoechst's Canadian operations.

Klee is still president of Hoechst

Farwerke Hoechst is also active in Canada and Latin America. Here's how the company is represented to the North and South

CANADA

Hoechst Industries Ltd. (Montreal), formerly Trans Canada, is the holding company for:

Canadian Hoechst Ltd. (Montreal), which sells all Hoechst products in Canada (with exception of pharmaceuticals). It also sells dyestuffs of Durand & Hugenin (Basle), Fabbrica Lombarda Colori Anilina (Milan). It has three divisions: Hoechst Chemicals Co., Hoechst Dyestuffs; and Carbic Color Co.

Hoechst Pharmaceuticals of Canada Ltd. (Montreal), which is a joint (50-50) subsidiary of Hoechst and Upjohn, handles Hoechst pharmaceutical sales in Canada.

LATIN AMERICA

Trans-American Chemicals Ltd. (Montreal) is the holding company for:

Quimica Hoechst S.A. (Buenos Aires), sales company for Hoechst products in Argentina. Additionally, it polymerizes vinyl acetate, produces "Behring" biological pharmaceuticals and packages various Hoechst pharmaceutical specialties.

Fongra Produtos Quimicos S.A. (San Paulo, Brazil), a plant producing solvents, sodium hydroxide, insecticides, fatty alcohol sulfonates.

Hoechst do Brasil S.A. (Rio de Janeiro, Brazil), a sales company for Hoechst products and those of Fongra. It also has a pharmaceutical packaging plant in Suzano near San Paulo.

Quimica Hoechst Chile (Santiago, Chile), a sales company for all Hoechst products. Also has a pharmaceutical packaging operation.

Hoechst Colombiana Ltd. (Cali, Colombia), which has sales rights for Hoechst for Hoechst products. It has branches in Bogota, Barranquilla, Medellin and Bucaramanga, also packages pharmaceuticals.

Quimica Hoechst de Mexico S.A. (Mexico City) and its 100% subsidiary **Farmaceutica Hoechst Mexicana S.A. (Mexico City)**, which handle sales of Hoechst products in Mexico. Additionally, they manufacture "Behring" biologicals and package pharmaceuticals.

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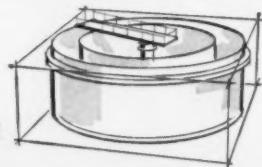
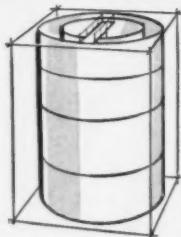
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Process Trends

from
DORR-OLIVER

A SERVICE TO THE PROCESSING INDUSTRIES

"PACKAGED UNITS" SOLVE PLANT WATER TREATMENT AND SEWAGE PROBLEMS



The trend to dispersal of industrial plants and the location of new factories in previously undeveloped areas often involves problems of water treatment and sewage disposal. Even when plants have been long established, the same problems may arise as existing facilities become inadequate or conditions change in the surrounding area.

A ready solution is found in the new "packaged" treatment units now available from Dorr-Oliver. Essentially, these offer all the advantages of conventional, large scale systems in a compact, easily installed form suitable for individual plant installations. Basic equipment for each unit is all designed into a single tank. This "unitized" approach not only produces simple, easily maintained units, but also results in relatively low cost.

The Dorrc PeriFilter System, for example, combines a pre-treatment mechanism and a rapid sand filter to provide a continuous supply of purified water. Depending on the pre-treatment method used, the unit will remove hardness, turbidity, color and/or iron and manganese. Operation can be manual, semi-automatic or fully automatic.

The Dorr-Oliver CompleTreator is a complete sewage treatment unit, operating on the modern Biofiltration principle. In a single welded steel tank, it combines processes that normally would require five tanks. It is so compact that it can be shipped complete by rail or truck, yet has a treatment capacity for 150 population equivalent. Where greater capacity is required, two or more units can be readily installed, or consideration may be given to other Dorr-Oliver equipment.

The development of treatment plants for water, sewage and industrial wastes has long been a Dorr-Oliver specialty. If you'd like to learn more about such equipment, with particular application to your own special problems, just drop a line to Dorr-Oliver Incorporated, Stamford, Connecticut.

Dorr-Oliver offers a wide range of equipment, methods and complete systems for the processing industries. Examples include:

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SPECIALTIES

Industries Ltd., as well as being head of Trans-American Chemicals Ltd., which was set up in '58 as a holding company for Hoechst's Latin-American operations. He is, in addition, chairman of Industria (Ore & Chemicals) Ltd., a pyrite exporter.

First U.S. company bought by Intercontinental was Progressive Color & Chemical Co., Inc. (New York), a small distributor and importer of chemicals and related products. This gave Intercontinental (i.e., Hoechst) a sales nucleus. Manufacturing facilities were picked up soon after.

In April '54, Intercontinental bought majority interest in Metro Dyestuff Corp., a West Warwick subsidiary of Metro-Atlantic Inc. (Centredale, R. I.). After purchasing this operation—consisting of a large old textile mill and about 19 acres of land, Intercontinental poured almost \$2 million into a face-lifting operation, is now turning out — under the Hoechst Chemical Corp. name — a variety of chemical specialties, dyes and pigments, pharmaceutical intermediates and photo developers.

In Jan. '57, Intercontinental again expanded, by purchasing a long-established New York jobber and importer of aniline colors and chemicals, Carbic Color & Chemical Co., which was doing about a \$5-million/year business. This gave Hoechst a sales group that could handle pigments and dyes—such as its patented fiber reactive, vinyl-sulfon Remazol colors—which the company was turning out both here and in Germany.

Progressive Color & Chemical was then able to concentrate on nondye-stuff products.

The purchase of Carbic Color & Chemical by Hoechst was the initial step in a series of purchases by which the three offshoots of the disbanded I.G. Farben Co. (Bayer, Badische Anilin- & Soda-Fabrik AG. bought Nova Chemical Corp. (Beacon, N.Y.) through its holding company, BASF Overzee N.V., and changed its name to Putman Chemical Corp. Farbenfabriken Bayer AG. (Leverkusen, Germany) got back into the dye business in '58, when it acquired — through Bayer Foreign Investments Ltd. (Toronto, Can.) — the business

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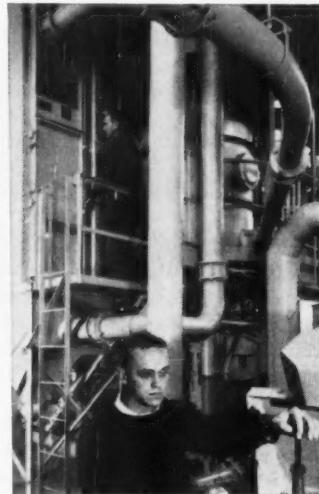


SET A TUNNEL DRIVING RECORD — For New York City's latest water tunnel, a 43.64 mile bore was completed in the record time of 841,000 man-days—ten months ahead of schedule. Clancy O'Dell, project manager, depended on Hercules® short-period

electric blasting caps. Pioneering in the field of industrial explosives has always been part of Hercules' history and this extensive background is available through a world-wide staff of explosives technical service men.



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PROTECT INDUSTRIAL EQUIPMENT — Protective coatings based on Parlon®, Chlorinated natural rubber, are being used from coast-to-coast. A typical example of the outstanding performance of Parlon coatings is at the Middlesex County Sewage Disposal Center in Sayreville, N. J., where a Parlon-based paint has been selected to protect equipment under extremely challenging conditions.

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SPECIALTIES

These officials, all German-born, head Hoechst's holding company in the U.S.



Max E. Klee, Intercontinental president, is top Hoechst man in U.S.



L. C. Balling, formerly with Bayer, is Intercontinental vice-president.



E. P. Sommer, ex-textile chemist, is also Intercontinental vice-president.

of Verona Pharma Chemical Corp., which has plants in Union, Bayonne and Newark, N.J.

Call It Hoechst: In Feb. '57 Intercontinental began renaming its subsidiary operations. It started by changing Metro Dyestuff to Hoechst Chemical Corp. The Hoechst name was also used when Hoechst Pharmaceuticals — the group that laid the groundwork for its newest acquisition — was formed as an Intercontinental subsidiary in Oct. '58. (Pharmaceutical manufacturing won't be new to Hoechst in the U.S., however; Hoechst Chemical has been producing semi-finished forms of the Hoechst-developed oral antidiabetic that Upjohn upgrades and sells as Orinase.)

Also in '58 another subsidiary was rechristened when the former Wax and Rosin Co. (under its former owner Bruno Young) was changed into Hostawax Co. and made a division of Progressive Color & Chemical — soon to have its own name changed to Hostachem Corp. Hostawax handles only one product line: the extremely hard Hoechst waxes, formerly Gerstoffen (I.G.) waxes, refined from coal-derived raw montan waxes in Germany.

Where's Uhde? Probably the most difficult operation to place in its proper organization niche is the Hoechst Uhde Corp. This operation is not a part of the Intercontinental setup — though it shares the same offices. It handles orders for construction of plants using patents, processes, and know-how that Hoechst's engineering subsidiary, Fredrich Uhde

(Dortmund, Germany) has either developed or for which Uhde holds license rights from Hoechst, Knapack and/or other Hoechst subsidiaries.

In the U.S., not all Hoechst processes work through this licensing group. For instance, while Columbia-Southern's new chlorine producing plant at Martinsville, W. Va., and the Hooker Chemical plant going up at Niagara Falls are licensed by this group, Hercules' high-density polyethylene plant—which uses Hoechst-developed techniques — is not.

Hoechst Uhde has no construction company connected with it in the U.S., but it does have working arrangements with two U.S. companies: Arthur C. McKee & Co. (Cleveland) — for setting up organic processes; and The Lummus Co. (New York) — for construction of inorganic materials plants.

How Far: In the few years that Intercontinental has been active in the U.S. it has widely promoted the Hoechst interests. An obvious question is how much bigger it plans to grow. When asked this by *CHEMICAL WEEK*'s reporter in Bonn, Hoechst replied: "We are viewing the U.S. market with moderate curiosity." The word "moderate," it's said, reflects the fact that Hoechst's exports to the U.S. — despite the comparatively long list of outlets here — accounted for only 4.3% of the company's total exports (\$171.4 million) in '59.

And although Hoechst says that in the foreseeable future it will turn out mostly specialty chemicals — espe-

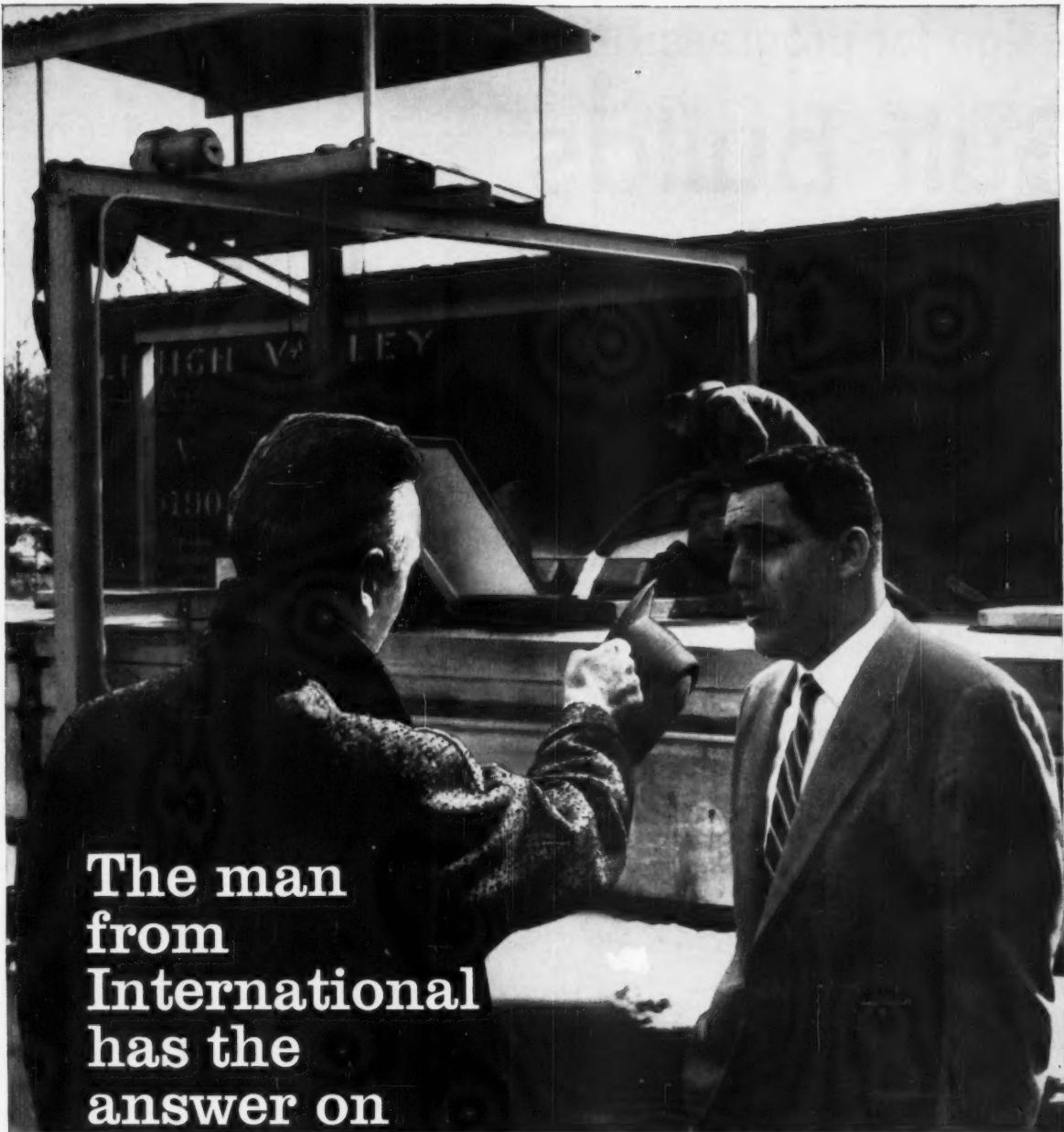
cially dyestuffs and pharmaceuticals — U.S. chemical trade observers wouldn't be surprised to see Hoechst following Bayer and Badische into a joint venture with a U.S. chemical company to produce basic chemicals.

X-Ray Film Duplicator

An inexpensive way to reproduce X-ray films with "sufficient detail to maintain diagnostic quality" has been developed at The University of Michigan. Key to the process: a new type of diazo film, No. 111CTF, produced by the Ozalid Division of General Aniline & Film Corp. The new film allows direct positive reproduction of X-ray films in two minutes in standard diazo machines.

The new diazo film, still not commercially available, has a high-contrast coating on one side, a low-contrast coating on the other, and a filter between (to keep light from passing through). The film to be copied is run through the machine twice, first in contact with one side, then with the other, to get good gradation of tone. The new film was developed originally for duplication of Polaroid transparencies. Approximate cost for an 8 1/2 x 11-in. sheet is around 50¢.

The new technique should be helpful in teaching roentgenology, according to its developers, Walter Whitehouse, Fred Hodges, and Fred Anderegg, all medical doctors. It will also allow more hospital-to-hospital transfers of patients records without disturbing the original film file.



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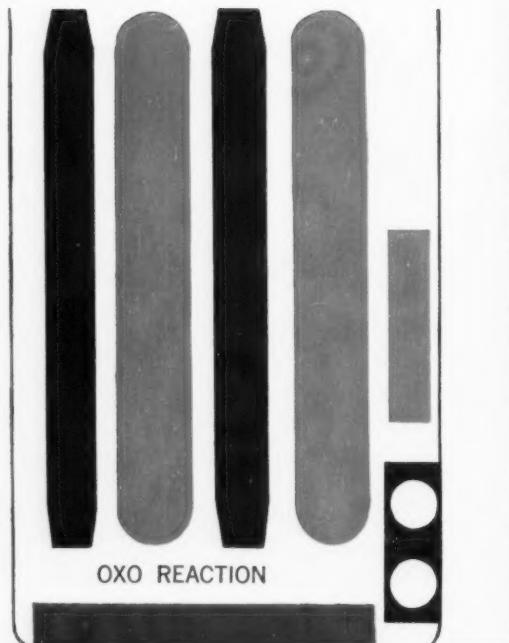
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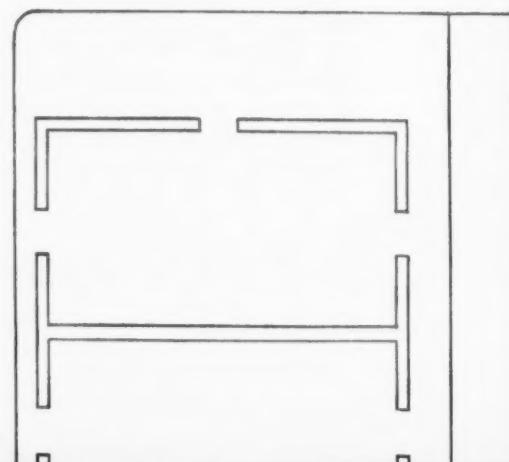
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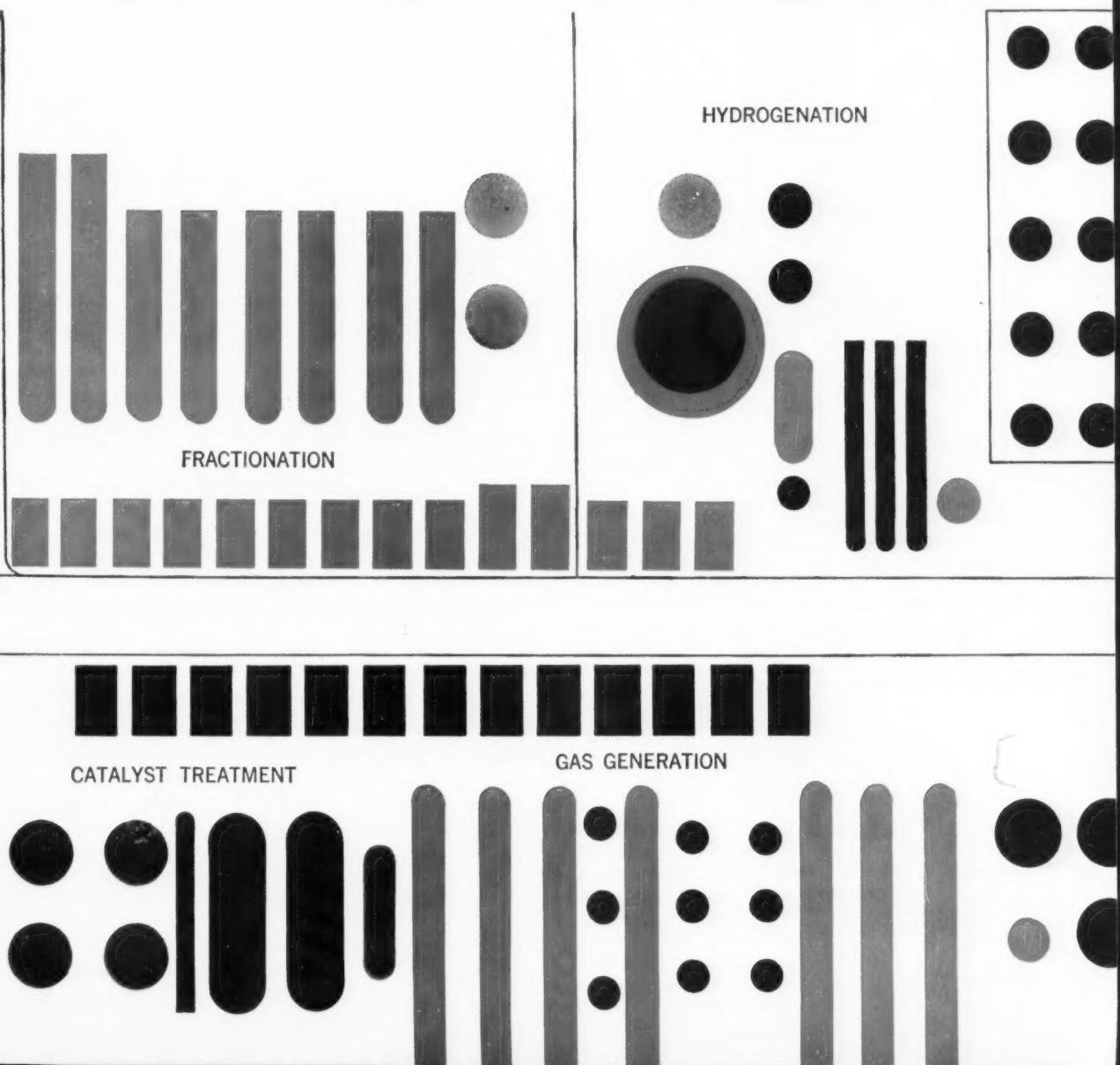


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SPECIALTIES

Cure for Drifting

A solution of the problem of drift in herbicides and other agricultural chemicals has been developed by Southwest Agricultural Institute (San Antonio, Tex.).

The remedy is a new type of nozzle-and-spray system that mixes oil, herbicide and water to produce a uniform-droplet spray that has the consistency of mayonnaise. The institute's tests reveal that the novel invert emulsion spray has low-drift characteristics under a wide variety of wind conditions.

The emulsifying process can be done by airplane, helicopter and all types of water and ground apparatus, including hand sprayers.

The new system holds promise in application of hormone-type herbicides for controlling some brushy and woody plants. With such plants, the problem of drift has been so serious that herbicides can rarely be used.

Another suggested use is in industries requiring intimate mixing of controlled dosages, such as the mixing of additives with gasoline.

PRODUCTS

Sweater Red: General Dyestuff Division of General Aniline & Film Corp. (New York) has introduced a new red cationic dyestuff, Genacryl Red 4B. The dye yields a bright bluish red shade, is suggested primarily for obtaining deep shades of red on acrylic and modacrylic fibers. The dye's strength, brightness and economical qualities are claimed to be particularly applicable for use on yarns.

Synthetic Oil: Lehigh Chemical Co. (Chestertown, Md.) is marketing an improved synthetic oil, Anderol L-423, for chart drives, clock movements, and meteorological and aircraft instruments that must operate at extremely low temperatures. The light-viscosity diester oil is available in pint, quart and gallon cans, and in 5- or 55-gal. drums.

Corrosion Protection: Bee Chemical Co. (12933 South Stony Island Ave., Chicago) has introduced a new corrosion-protection system, Lacqua Process, for use on brass and brass-plated steel. The treatment employs a nonflammable, water-thinnable surface-active agent.

Gray Line: Allied Chemical's National Aniline Division (New York) has added Lanamid Grey GBL to its line of neutral, premetalized dyes. It is said to have good wash- and light-fastness, superior nondusting qualities. Price: \$4.65/lb. in 250-lb. bbls.

Haulm Herbicide: A new nonarsenical chemical spray for destroying potato haulm has been introduced by Imperial Chemical Industries (London, England). Reglone, based on a new quaternary ammonium compound named Diquat, is claimed to be harmless to humans and livestock, to leave no harmful residue in the soil, and to be more efficient than arsenical compounds. Cost of treatment: approximately \$8/acre.

Self-Cross-Linking Polymer: Rohm & Haas Co. (Philadelphia) has developed a new acrylic resin dispersion, Rhoplex HA-12, for making nonwoven fabrics. Properties of the resin—a self-cross-linking polymer—are said to include good durability to both laundering and drycleaning, flexibility, stability and high film strength. The product may be applied by spray or saturation. Cost: 23¢/lb. in bulk.

Scented Toothbrushes: Tek-Hughes Division of Johnson & Johnson (Watervliet, N.Y.) is making children's toothbrushes scented with ice cream flavors. The odor—chocolate, vanilla, orange, lime, lemon or strawberry (in the plastic handle of each brush)—is said to last the lifetime of the brush.

Fire Starter: Chase Products Co. (Box 42, Maywood, Ill.) has introduced nationally a spray charcoal lighter in paste form that's said to eliminate flashback hazards of conventional lighting compounds. Red Fire Paste Charcoal Lighter is suggested for cooking fires, burning leaves and trash. Price: 79¢/16-oz. can.

Softener: An improved cationic softener is now being offered by Onyx Chemical Corp. (190 Warren St., Jersey City, N.J.). It's called Onyxsan FW-25%, will disperse in tap water (steam-boiling isn't required). Suggested uses: as a lubricant for acid fulling, an exhaust-type softener for long bath applications, and a yarn and skein lubricant following dyeing.

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SPECIALTIES

EXPANSION

Texize in Tampa: Texize Chemicals, Inc. (Greenville, S.C.), will open a new plant in Tampa, Fla., to produce liquid laundry starch and bleach products.

Elbow Room: State Chemical Corp., supplier of chemical compounds for drycleaning and laundry industries, will move into new, larger quarters at 5699 Rising Sun Ave., Philadelphia.

Packaging Entry: Columbian Carbon Co. (New York) will expand its activities in the printing ink field with acquisition of Ander Chemical Co. (Cincinnati), ink supplier to package printers. Columbian paid an estimated \$3 million for Ander.

Storage Space: Enthone, Inc. (New Haven, Conn.), has doubled its warehousing facilities in New York state with the addition of a warehouse in Syracuse. The company also maintains a facility in Binghamton.

Plant Addition: Speco, Inc. (Cleveland) has completed a 30,000-sq.ft. addition to its chemical division plant to increase production capacity of its Hum-I-Dri moisture absorbent and Ice Rem, for melting ice and snow.

West Coast Line: A new aerosol filling line with capacity to package more than 750,000 units/month has been put into operation by Par Industries (Los Angeles), custom aerosol loader. Included in the expansion are two additional bulk tanks for storage of propellant gases.

Open New Offices: Refined Products Co. (Lyndhurst, N.J.) has opened sales offices in Charlotte, N.C., and Columbus, Ga. A research laboratory and warehouse have also been completed in Charlotte.

Paint Primer: Tropical Paint Co. (Cleveland) is offering a new rubber-base primer, Chemical Resisting White Primer, for industrial use. Suggested applications are in plants where moisture condensation and mildew growth are problems. The primer is reported to be especially suitable on new plaster, masonry and hardboard, and unpainted iron and steel surfaces.



The measure of man's resourcefulness is limited only by his imagination . . . or so it seems in today's fast moving world, particularly in the exciting field of organic chemistry. Along these lines we have developed a highly reactive group of aliphatic polyfunctional molecules that can do more than trigger the imagination. You'll find concrete applications in any number of end products . . . perhaps the one you are working on now. Literature and samples available upon request.



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CYANAMID

Chemical Newsfront

SOLVENT ENAMELS FEED THE FLAMES

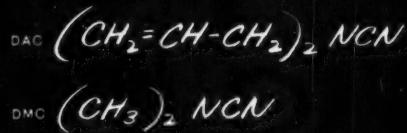


MELAQUA ENAMELS PUT THEM OUT



EXCITING NEW VEHICLE FOR BAKING ENAMELS is Cyanamid's MELAQUA* 600. This new product is a melamine-acrylic resin that produces a ready-to-spray enamel with only the addition of pigment and water. By excluding the use of solvents, Melaqua 600 completely eliminates fire hazards (see photos above). In addition to its safety factor, it gives the enamel such desirable qualities as exceptionally good flow and levelling, high gloss, and clearer, brighter colors than solvent enamels of the same pigmentation. Melaqua 600 enamels retain colors well under heat and light, have outstanding outdoor durability. Suggested uses for this new resin are full color, pastel metallescent industrial and automotive finishes.

*Trademark (Plastics and Resins Division)



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(Market Development Department)



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(Rubber Chemicals Department)

NEW CATALYST TAKES THE FIELD. Cyanamid's new fluid cracking catalyst, AEROCAT® 3C*, is now undergoing extensive testing in the field. Composed of silica, alumina and magnesia, the new catalyst is designed for more flexible and profitable refinery operation. Its advantages over current silica-alumina compositions: yields more gasoline, more propylene and more butylene — produces less coke and dry gas. Aerocat 3C is available in two forms: Aerocat 3C-12 for high gasoline yield; Aerocat 3C-20 for high propylene and butylene yields.

*Patent applied for.

(Industrial Chemical Division)

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MORE AND LOVELIER CARPET COLORS. Here's good news for the carpet industry and its consumers: Cyanamid's new CALCO® LEVELING SALT LV eliminates objectionable striped or Barré effects encountered in dyeing wool carpeting — permits carpets to be dyed effectively in the widest range of colors ever! The agent also is expected to prove equally advantageous in dyeing nylon carpeting, hosiery and sweaters. When used with neutral dyes, Calco Leveling Salt produces deeper, level, solidly dyed shades on wool and/or nylon stocks, yarns and fabrics. Cyanamid's new agent allows the colorant to dye rather than stain the fiber. As a result, shades may be matched by adding color in process — not possible with other agents of this type. Calco Leveling Salt has no adverse effect on the fastness of the dyes used.

(Dyes Department)

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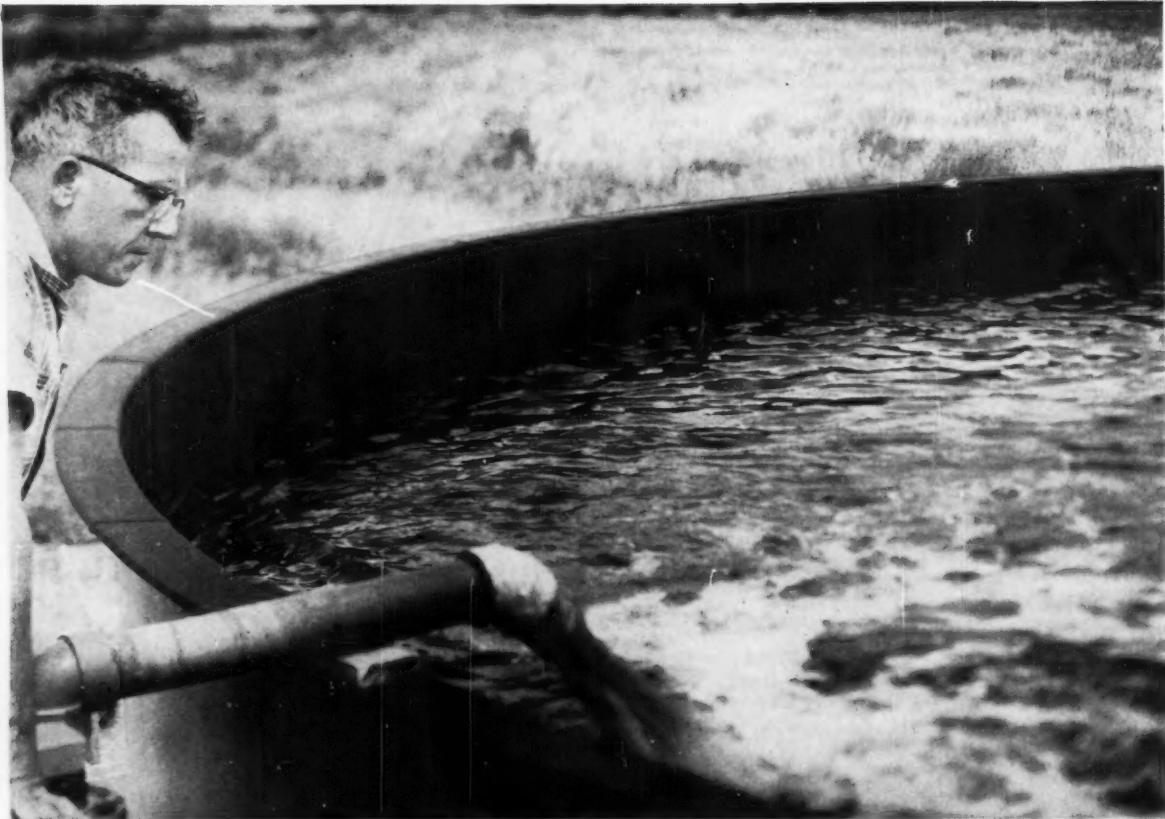
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should last at least 7 times longer

Huge, 100,000 gallon acid-storage tanks are a necessity with Kaiser Aluminum & Chemical Corporation . . . and *were* a problem. The redwood tanks previously used for storage of incoming hydrofluosilicic acid deteriorated rapidly, sprang costly-to-repair leaks, lasted for only 2½ years.

New tanks are now being erected, protected with Permabond, the rubber lining that is unaffected by a wide variety of highly corrosive "problem" chemicals. While no performance figures are yet available, naturally, the experience of other chemical manufacturers, processors and users has led Mr. J. A. Watson, Superintendent of the Kaiser Aluminum plant in Mulberry, Florida, to estimate a minimum life for the new Permabond®-protected tanks of at

least 15 to 20 years. It is quite possible, in fact, that the acid will serve to *protect* the Permabond lining from eventual weakening from *other, outside* causes!

Used by Kaiser Aluminum and a wide variety of progressive companies for its demonstrated superiority over other lining materials, Permabond can be applied to existing as well as new equipment. Your local Permabond Applicator will be glad to provide you with Permabond protection service . . . select the compound, prepare the surface, apply the rubber and vulcanize the entire lining. *Get in touch with "U.S." at address below for Authorized Permabond Service in your locality.*



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Technology Newsletter

CHEMICAL WEEK
June 18, 1960

Research aimed at improving columbium's strength and oxidation resistance in the 2000-3000 F range for missile and nuclear applications was revealed by Union Carbide Metals Co. last week at a symposium of the American Institute of Mining, Metallurgical and Petroleum Engineers at Bolton Landing, N.Y. Basic problem: to find alloying elements that won't harm columbium's good fabricating qualities and low thermal-neutron-capture cross-section.

Additions of 5-15% titanium and more than 15% tungsten give 100 times better oxidation resistance than does pure columbium, and permit short-time service in air at temperatures above 2200 F, which may help solve missile re-entry problems. Additions of 3% aluminum and vanadium give 50-100 times better oxidation resistance in the 1500-2200 F range, retain columbium's good nuclear cross-section.

Increased usage of columbium in military and nuclear applications could help bring the price down (now \$30-50/lb. for roundels, melting stock), make columbium an attractive material for chemical construction. The metal's corrosion resistance, although not quite so good as that of its sister metal, tantalum, is in the same range. And its greater abundance in the earth's crust promises for it an enhancing future.

A new silica-magnesia catalyst that offers more operating flexibility and better balance of cat-cracking products is being unveiled by W. R. Grace & Co.'s Davison Chemical Division at this week's Western Petroleum Refiners Assn. meeting. It's identified as SM-30, priced competitively, and can be used interchangeably with 13% silica-alumina catalysts to provide higher yields of gasoline and furnace oil, lower quantities of less-desired products such as coke, light gases and residual fuels.

To solve problems encountered with earlier silica-magnesia catalysts—poor regenerability and thermal stability—researchers at Grace's Washington Research Center (*CW, Oct. 25, '58, p. 101*) combined new evaluation techniques and recent experience with silica-alumina catalysts to come up with new manufacturing methods and improved physical properties.

Several refineries are reportedly interested in SM-30; Davison expects to have it on commercial trial by the end of the year.

Uranium is under study as a steel-alloying ingredient by Canadian researchers of the Mines and Technical Surveys Dept. in Ottawa. Experimental batches (up to 500 lbs.) have been made with uranium contents ranging from $\frac{1}{2}$ lb. to 4 lbs./ton of steel. Goal: improvement by as much as 30% in steel's resistance to fatigue and corrosion, decreased requirements of conventional alloying ingredients such as manganese, nickel and chrome.

Technology Newsletter

(Continued)

John Convey, director of the mines branch, describes results of the alloying studies as "exceptionally encouraging," but cautions that they have yet to be proved out in quantity production. As to cost, Convey concedes that depleted uranium (used in the tests) is still relatively expensive but points out that it's becoming cheaper. The researchers also plan to study additions of oxides or ore concentrates as well as the metal.

A 4-lb. addition of uranium to every ton of steel produced in Canada could consume about half of the country's present production. This new use would come as a welcome shot in the arm to Canada's \$325-million/year uranium mining industry, which faces virtual extinction upon the completion of contracts expiring in the next few years.

Potent new stimulants emerging from clinical trials were described at the recent 109th annual meeting of the American Medical Assn. in Miami. Phenimino-oxazolidinone (code name, NPL-1), developed by Nordson Pharmaceutical Laboratories (Irvington, N. J.), reportedly overcomes emotionally induced lethargy in three out of four patients. It also appears effective against narcolepsy, a rare disease whose victims fall asleep abruptly at any time or place.

Emivan (3-methoxy-4-oxy-benzoic acid diethylamide, a vanillic acid derivative first synthesized in Austria) rescues victims of barbiturate, narcotic, or other depressant drug overdosage. The stimulant has also been successful in counteracting respiratory depression, eliminating the need for emergency measures such as tracheotomy (surgical opening of the windpipe). Emivan was researched by U. S. Vitamin & Pharmaceutical Corp.

First of a series of nonnuclear detonations is scheduled for firing next month as part of the Atomic Energy Commission's Plowshare program. Plowshare is designed to seek peaceful uses of nuclear explosives in production of isotopes and power, development of natural resources, etc. The 500-ton chemical explosive charge, buried 125 ft. deep, will go off July 12 in the northern section of the Yucca flats, the AEC's Nevada test site. The explosion is planned to obtain additional information on the relationship between energy yield, depth of burial, and crater size.

Britain's Atomic Energy Authority has opened the door to private participation by chemical firms in that country's nuclear program. Recent collaboration and licensing agreements between AEA and two engineering companies—W. J. Fraser & Co. Ltd. and Nuclear Chemical Plant Ltd.—are expected to bolster British industry's bid for export business in the design and construction of nuclear chemical processing facilities. Under the agreements, AEA will turn over to the private firms know-how and experience in uranium processing from ore to metal, spent fuel reprocessing, and radioactive waste treatment and disposal.

Progress Report...

—NIAX Triol LK-380

—KROMFAX solvent

New polyether base for better, lower cost rigid urethanes

A new triol, NIAX LK-380, is now commercially available for the production of rigid urethane foams. NIAX LK-380 makes possible rigid foams with excellent humid aging properties, lower water absorption, and lower production costs.



Insulation for acoustical tiles, refrigerators and freezers are some applications of low density rigid foams made from LK-380. It is suggested in the fabrication of sandwich partitions for construction, in nonsinkable boats, life buoys, and deck guards. Foams made from LK-380 can be blown with fluorocarbon gases to give excellent thermal insulation. Investigation of LK-380 for urethane coatings and adhesives is also suggested.

Liquid NIAX Triol LK-380 (hydroxyl number, 380) is made to the same rigid specifications as other NIAX diols and triols. Rigid specifications are your assurance of excellent reproduction of foam properties—in a partial prepolymer or one-shot process.

NIAX Triol LK-380 is one of CARBIDE's many NIAX diols and triols, and is available in tank cars, compartment tank cars, or drums in carload or LCL lots.

A Technical Representative in any CARBIDE office can furnish you starting formulations. For his address or for a new technical bulletin on LK-380, including specifications, suggested formulations, and foam properties, please mail the coupon.

Current news about a time-tested solvent

KROMFAX solvent (thiodiglycol, thiobisethylene glycol, B, B' dihydroxyethyl sulfide) is a powerful, chemically-neutral solvent for vat, basic and acid dyestuffs. It is non-volatile, almost colorless, and completely soluble in water. Its hygroscopic and antioxidant properties have long been important in the dyeing industry.

The use of KROMFAX solvent to prepare printing pastes from vat dyestuffs yields a higher color intensity than that obtained with alcohol or glycerol. It gives a finer dispersion of the dye prior to reducing it and improves the solubility of the sodium leuco form. KROMFAX solvent also markedly increases the fixing rate in the pre-reducing process. Its anti-oxidant nature prevents premature conversion of the leuco base of a vat dye into the finished color.

KROMFAX solvent is especially suited for pasting basic dyestuffs usually difficult to dissolve, such as indulines and nigrosines. It is also excellent for dyes used in direct printing and in color discharge and resist printing. It helps to produce prints of higher color values in wool, silk, acetate, rayon, and nylon fabrics.

KROMFAX solvent is also useful in cleaning printing rolls on which dye pastes have become laked and precipitated in the pattern.

With thiourea and ammonium sulfate, KROMFAX solvent forms a "universal combination" that simplifies the printing of nylon with acid and direct colors. The mixture dissolves the dye, swells the fibers, and fixes the dye in the fibers.

KROMFAX solvent will condense with hydroxyl-containing compounds in the presence of acid catalysts to form mixed ethers, many of which are effective synthetic lubricants. Thiodiglycol reaction products have good inherent anti-oxidation properties, due to the sulfide link-

age. Their oil-solubility makes them of interest as extenders and additives for lubricating oils. A complex ester prepared by the reaction of thiodiglycol with butyric acid and thiopropionic acid gives mineral oil lubricants greater load-carrying capacity, with better film strength.

Drum quantities of KROMFAX solvent are available from CARBIDE in LCL or carload lots. Check with the Technical Representative in your local CARBIDE office for further information. A technical bulletin listing properties, suggested applications, specifications, and other facts can be obtained by checking the coupon on this page.

Tear out this coupon. Check the boxes on which you'd like more information, and mail to Dept. H, Union Carbide Chemicals Company, 30 East 42nd Street, New York 17, N. Y.

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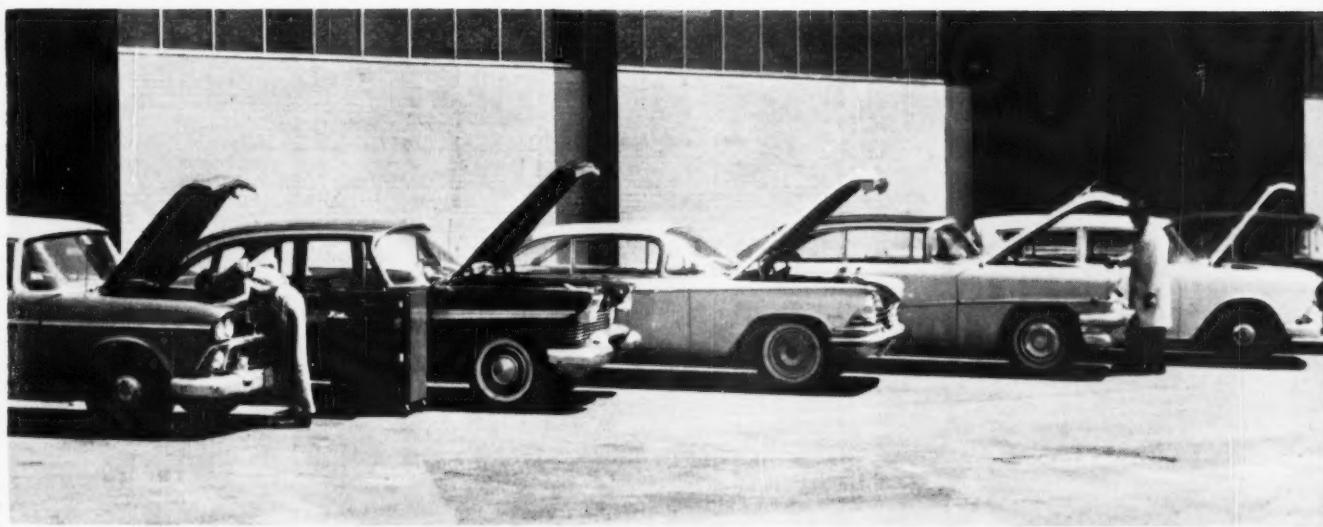
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Meeting the requirements of many different types of autos is a major objective in antifreeze research.

Under-the-Hood Story: Antifreeze Research

The status of antifreeze research changed again this week, as recent lab products made the shift to commercialization. Just-launched Dowgard (by Dow) and Telar (by Du Pont), for example, have now been followed on the market by Union Carbide's new Prestone Long-Life Coolant (CW Technology Newsletter, June 11).

Assuredly, major manufacturers of antifreeze aren't slowing their searches for longer-life inhibitor systems. And the need for new formulations — to protect next year's new liquid-cooled aluminum engines — will mean plenty of work for the labs. But the major research headache at the moment hinges on neither inhibitors or new engines, but on the plethora of standards and testing methods now in use, and the uncertainties of how each will be changed to suit the new aluminum engines.

Chain Reaction: Dow's introduction last January of Dowgard "year-round cooling system fluid" touched off a round of soul-searching on the part of its competitors: How should they meet the challenge? Du Pont's answer came in April with the introduction of Telar "never-drain" antifreeze and antirust coolant (CW, April 23, p. 113), patents on which have just been issued. Carbide gave

its answer in the form of Prestone Long-Life Coolant. Commercial Solvents, on the other hand, stepped out of the antifreeze business by selling it to Chatham-Reading (CW, June 11, p. 21).

The rapidity with which these products followed one another indicates that not one was caught short in its research effort. (Du Pont reports that it's been fleet-testing Telar for five years, while Carbide's new product has been under test for three years.) Other antifreeze researchers, including Olin Mathieson, Allied, Jefferson Chemical, Cities Service and Wyandotte, aren't likely to be far behind. And Chatham-Reading will most probably work out a research agreement with Commercial Solvents, which has retained its technical group at Terre Haute.

No Breakthroughs: However, it's also quite clear to industry observers that none of the products involves any major technological breakthrough. Official advice to the contrary, say the experts, there are several antifreeze formulations on the market or in the laboratories of various companies that can safely be left in most cooling systems for more than a single season.

Thus, prevailing opinion is that the new products consist of the best

available inhibitor combination — plus an added feature. In Dow's case the major novelty is in the use of deionized water to predilute the glycol-inhibitor solution to a ready-for-the-radiator strength, thereby avoiding corrosive ions found in tap water. Du Pont's special feature is the inclusion of a pH-sensitive indicator to enable the motorist to tell when the fluid needs to be changed.

Carbide isn't offering any special attraction in its long-life product, is content to rely on the Prestone name to carry the new contender; moreover, the company plans to continue giving the greater part of its attention to getting motorists to fill up with regular Prestone every year.

The patent picture bears out the opinion that there hasn't been any radical breakthrough. Dow has not patented its Dowgard, and there is no apparent reason why any other manufacturer with a high-quality glycol-and-inhibitor formula couldn't dilute it with deionized water. And Du Pont's two new patents (U.S. 2,937,145-6) cover a system consisting of glycol, water, sodium metaborate (a well-known inhibitor) and various pH indicators, particularly phenol red. Plainly, there's plenty of room for work on longer-lasting inhibitors. But licking the corrosion problem is not

RESEARCH

the whole story, say several experts. They point out that any glycol-water mixture has a lower coefficient of heat transfer than water, perhaps increasing the possibility of summer driving troubles.

Aluminum Hurdled: With liquid-cooled aluminum engines expected next fall on several cars (e.g., Rambler; Chrysler's Plymouth, Dart, Valiant and Lancer; GM's Oldsmobile F-85 and Buick Special), antifreeze makers have had to provide for protection against high-chloride and other corrosive waters. A Wyandotte study disclosed at the mid-May meeting of the Chemical Specialties Manufacturers Assn., for instance, notes that aluminum corrosion is particularly severe when chloride content exceeds 200 ppm., even when the water is mixed with some commercially available antifreezes.

The manufacturers have had ample warning, however, and report that they've come up with suitable formulations, some of which are already on the market.

What's Standard? The advent of aluminum is causing revision in standard antifreeze specifications and testing methods, however, much to the confusion of the industry. The American Society for Testing Materials, Society of Automotive Engineers, and all automobile manufacturers are concerned with the drawing up of their own standards — some of which will not be firm until next year. And many private labelers, who buy antifreeze made up to their formulas, have their own ideas about testing.

The biggest change taking place is a switch from use of distilled water in making up standard solutions to a variety of other "standard" waters. Reason: although distilled water provides a convenient standard, it doesn't give results that correlate well with actual conditions. Thus General Motors has adopted a standard water containing 100 ppm. chloride and 200 ppm. sulfate. Chrysler, on the other hand, uses a number of standard waters, corresponding to conditions in different parts of the country.

A possible upshot is that different grades of antifreeze may be made to meet varying local water conditions. But the preferred solution would be to design the antifreeze to meet the most extreme conditions, if it can be done economically.



Senator Long: An end to 'giveaways.'

New Patent Policy?

Efforts of Sen. Russell Long (D., La.) and other congressmen to end what they call "patent giveaways"—exclusive company rights to patents developed under government contracts—will get nowhere in this session of Congress. But failure of such efforts may spur establishment next year of a special committee to consider a uniform government policy on patents.

The only legislation moving this year is a bill that goes the other way—it would restore private patent rights in contracts of the National Aeronautics and Space Administration (NASA). It has been cleared for a vote in the House; but even if it passes, the Senate will bury it. NASA has been the only agency that has made patents developed under government contracts available to all takers. The House Space Committee moved to end that practice after NASA officials pleaded that many companies will not bid on NASA contracts under those circumstances.

A Senate Patents Subcommittee has studied and reported on the various patent practices of different government agencies and will report on the key one—Defense Dept.'s—later this year. The committee also issued a significant report on patents in antitrust cases. The report concluded that patent relief granted in antitrust settlements has not been of significant help to competing companies and has

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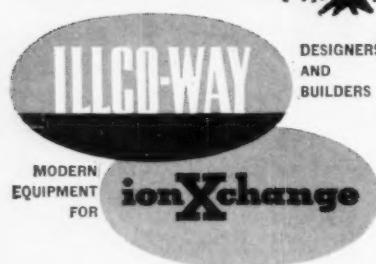
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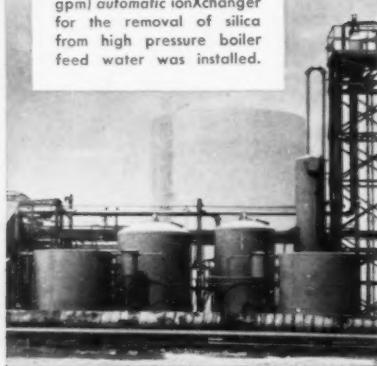
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RESEARCH

been overruled as a form of anti-trust relief.

One difficulty in enacting patent legislation has been that patent problems cut across the jurisdiction of several committees: Armed Services, Space, Judiciary, Small Business. Senator Long, as chairman of a small-business subcommittee on monopoly, may propose a special committee next year to work out a uniform policy.

Long feels that patents developed out of defense contracts should be made available to all comers. He says big contractors are merely strengthening their "domination" of business, particularly in industries such as chemicals, electronics or rocketry, where patents are especially significant. Many legislators agree with Long, but they are up against a powerful range of big companies. Only a major push would have any chance of success.

The impact of federal patent policies is emphasized by the fact that 60% of all R&D performed by American industry in '59—\$8 billion worth—was paid for by the federal government. Small business received only 3.5% of Defense Dept. R&D contracts, according to Senator Long.

Sealing Alloy

A new alloy for ceramic-to-metal seals has been worked out by General Electric using iron, nickel and cobalt in a "unique ratio."

Called Fernico-5, it closely matches the thermal expansion of alumina, which, despite high strength, heat resistance and insulating properties, hasn't had wide use in the electrical industry. Alumina's thermal expansion is much lower than that of metals and alloys normally used in ceramic-to-metal seals.

GE's vice-president and director of research, Guy Suits, says: "We now have an inexpensive and easily fabricated alloy that will enable us to use alumina in such products as electron tubes, thermionic energy converters, capacitors, switchgear, and high-temperature circuits."

Secret of the alloy is vacuum melting, which permits melting without addition of other elements such as manganese or silicon to control oxygen levels. The absence of these elements allows control of expansion characteristics and other properties.

EXPANSION

- The University of California Medical Center (Los Angeles) has built a laboratory vault equipped to check small amounts of radioactivity in the human body. It's for research on diagnosis of radioactive poisoning (e.g., by strontium-90), will also be available for emergency monitoring of victims of nuclear accidents.

- Du Pont has reorganized the Research and Development Division of its Polychemicals Dept., setting up a "new ventures" section headed by Donald Smith.

- Micro-Path Inc., a wholly owned subsidiary of United Industrial Corp., has formed a new instruments division with the acquisition of manufacturing, sales and distribution rights to all electronic and chemical devices produced by Robert R. Austin Laboratories (San Gabriel, Calif.).

- Standard Oil Co. (Ohio) has started construction of a \$170,000 control laboratory at its No. 2 refinery in Cleveland.

- Atlantic Research Corp. (Alexandria, Va.) has acquired Northeastern Engineering, Inc. (Manchester, N.H.), electronic equipment company.

- Pharmaceutical producer Winthrop Products (Rensselaer, N.Y.) has completed construction of a \$600,000 pilot plant.

- The U. S. Air Forces Air Research and Development Command, through its Wright Air Development Division, has awarded a \$12-million, three-year research and development contract on graphite for missile and space vehicle components to National Carbon Co., division of Union Carbide Corp. All development work on the contract will be conducted at the firm's labs in Fostoria, O., and Niagara Falls, N.Y., until new facilities at Lawrenceburg, Tenn., are ready in about a year. All research on the graphite program will take place at National Carbon's Parma, O., labs.

- Allied Chemical Corp.'s National Aniline Division has started construction of a one-story catalytic laboratory at Allied's Buffalo, N.Y., research and development center. Cost: about \$35,000, excluding equipment. The firm will complete current relocation of research at other plant sites to the research center.

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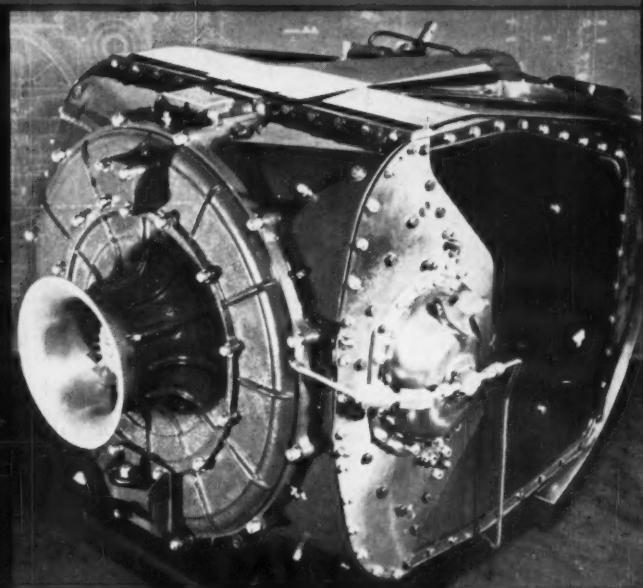
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MARKETS

Today: aluminum engines in small cars

Tomorrow: revolutionary turbine engines



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New Engines Alter Car Chemical Market

In the coming decade a technological evolution in the transportation industries is expected to spark major changes in markets for automotive chemicals. A number of important auto-chemical products—antifreeze, antiknock compounds, a host of lubricant and fuel additives—will likely see their end-use patterns greatly reshaped.

Increasingly, industry experts look to '65 as the pivot year when some of the more dramatic market changes will become particularly noticeable. But meanwhile there's still considerable faith in the basic stability of such automotive chemical work horses as tetraethyl lead and ethylene glycol.

This optimism is manifest, for example, in emergence of a new company that will make, among other products, tetraethyl lead, tetramethyl lead, ethylene glycol. Projected annual sales of the newly formed Chatham-Reading Chemical Corp.—jointly owned by Chatham Chemical and Philadelphia and Reading Corp. (CW, June 11, p. 21)—is put at more than \$50 million.

Forecasts of automotive chemicals

markets are, under presently evolving conditions, especially tricky to evaluate; but best available predictions (see chart, p. 116) point to general growth of the more established lube and fuel additives.

In some instances, of course, the total market for these chemicals will be substantially greater than indicated for automotive uses. Additional requirements for aviation purposes, for example, may push tetraethyl lead consumption to the 565-570-million-lbs./year range, ethylene dichloride to perhaps 163 million lbs., ethylene dibromide to about 174 million lbs. by '65 (CW, June 13, '59, p. 72).

Meanwhile ethylene glycol antifreeze use is expected to climb from an estimated 900 million lbs. in '60 to more than 1 billion lbs./year by '65. (CW, April 25, '59, p. 35). This conservative forecast takes into account likely impact of new car designs which will either reduce or wholly eliminate antifreeze requirements.

What will happen to the antifreeze market after '65 is a far rougher question to answer. By then, additional market factors—notably possible ap-

pearance of the gas turbine engine—may strongly influence the picture.

Aluminum Engines Pose Problems: There's considerable conjecture about the impact of new liquid-cooled automobile engines on use of antifreezes. Several makes of '61 autos will sport aluminum engines: two General Motors compacts, Oldsmobile's F-85, and Buick's Special will share a basically similar V-8 block. Rambler has a new in-line six block and Chrysler plans to make its slant six engine (used in Plymouth, Dart, Valiant, and the new Lancer) out of aluminum.

Moreover, by '62, some standard-size makes will switch over to the aluminum engines—but big-engine development has lagged ever since de-emphasis of the horsepower race in '58.

Aluminum will also be featured in other power components of new cars. For example, there's a new hydraulic transmission—designed for use either behind the engine or astride the differential where it becomes the much talked-about "transaxle."

Despite some talk to the contrary,

Estimated Automotive Chemicals Demand

(million lbs.)

	1958	1965
Tetraethyl lead	455	533
Ethylene dibromide	133	155
Ethylene dichloride	139	163
Antirust agents	4	5
Antioxidants	6.6	7.8
Dyes	0.8	0.9

Detroit car experts say the new aluminum engines are designed to be compatible with any existing, reputable service station products. "Absolutely no problem" is foreseen with respect to fuel additives and oils. Moreover, antifreezes are said to be satisfactory in more than 90% of the country without resorting to special formulations.

In the Southwest and in Kansas, where tap water runs 100-500 parts/million chloride, five major glycol suppliers have already agreed to have suitably inhibited normal antifreezes available by the time the new cars are marketed.

In general, car makers do not buy some CPI claims that new engines will need cooling with special lubricants, antifreeze materials, etc. But even if Detroit car makers assure buyers that special antifreeze materials aren't really needed for new aluminum engines, it's certain that customers will be reminded by antifreeze producers that, if not always vital, the new coolants are nonetheless safer and preferable.

Two new products watched with considerable interest are Dow's Dow-gard—described as a never-drain antifreeze and antirust coolant—and Du Pont's Telar which will also be touted as a product that is also a step closer to the mythical "permanent" antifreeze that car owners have long awaited (*CW*, April 23, p. 113). And last week Union Carbide introduced a permanent antifreeze (see p. 109).

But truly permanent cooling systems (aside from air-cooled engines now used on some small cars) won't come until perfection of a method such as the so-called "ebullient cool-

ing" system. (That's the technical description of a cooling system which transfers heat from metal by means of an azeotropic, boiling mixture and, unlike conventional systems, achieves cooling with vapor; one advantage is that both pump and thermostat are eliminated.)

Water is unsuitable for such systems. One candidate is Dow's ET-373, a product that is said to act as a thermostat, will keep metal parts of the engine at temperatures close to the boiling point of the coolant liquid. Dow says ET-373 lends itself to use in sealed cooling systems; but it's admitted that extensive mechanical redesign of auto engines must precede large-scale commercial application of the chemical in engine-cooling applications.

New Lube Era? Some experts say the big era for synthetic automotive lubricants is now at hand. It's evidenced by a rash of development programs aimed at pushing new lube products of the CPI firms that are maneuvering for good competitive positions in the era of "service-free" cars.

On the surface, advent of cars that do not require the once-a-month, or 1,200-mile, visits to the garage for lubrication appears to spell financial disaster for producers and retailers of lubrication products. But it's pointed out that no serious loss of income is likely—at least to producers—because the more permanent oils, lubes and coolants will carry higher initial price tags. In any case, oil and lube marketers are working hard to discourage the trend to less frequent lubrication.

Meanwhile lube production has declined steadily, and the drop has been

reflected in declining output of some—but not all—lube additives.

For example, total output of cyclic organic chemicals used as lube additives dropped from 400.3 million lbs. in '57 to 387.1 million in '58 ('59 data are not yet available); most items in this group—mostly salts of oil soluble petroleum sulfonates—contributed to the decline. The barium salt was down to 97.1 million lbs. in '58 (from 103.6 in '57); calcium salt declined to 104 million lbs. from 114.5 million; the sodium salt to 83.7 million from 99.3 million. However, miscellaneous cyclics production increased to 102.1 million lbs. in '58, from 83 million in '57.

Production of acyclic organic compounds, however, increased in the same period. Total production in '57 was 115.8 million lbs., 118.3 million in '58; but this was still below the 120.7 million turned out in '56. Within the general acyclic category, dithiophosphates declined, from 46.5 million in '57 to 45.6 million in '58; sulfurized sperm oil increased to nearly 8.8 million in '58, from about 6 million in '57; all other acyclics remained fairly constant—63.9 million lbs. in '58, 63.3 million in '57.

Gasoline additives have fared better because total gasoline production in the U.S. has climbed steadily. Total production of gasoline additives—not including tricresyl phosphate—amounted to almost 8.6 million lbs. in '58 (5.4 million lbs. N,N-di-sec-butyl-p-phenylenediamine and almost 3.2 million lbs. all other additives).

The amount of tricresyl phosphate going into gasoline is much harder to pin down because quantities used in gasoline are lumped together with amounts used for plasticizers in official statistics.

Turbines by '65? Meanwhile turbine-engine proponents look ahead to '65 as a realistic time when the automotive industry will start switching from traditional engines to gas turbines. If the switch comes, it should open broad new markets for special synthetic lubes—possibly to the tune of 4 million lbs./year tacked on to an estimated 36 million lbs. needed in '65 for other uses, mainly for military and commercial aircraft markets (*CW*, Jan. 23, p. 72).

Here's another guess about the turbine's auto debut time. At a recent Detroit meeting of the division of



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refining of the American Petroleum Institute, G. Huebner, Jr., of Chrysler Corp. reported that within another six years gas turbines may surpass piston engines in automobiles both from standpoint of engineering and cost and "will be able to do almost anything that can be done with the piston engine and can add to customer convenience and satisfaction by providing many advantages which the piston engine cannot provide."

Main chemical product to be hit hard by the gas turbine when it takes over in passenger cars, says Huebner, will be antifreezes, because cooling systems will be eliminated. If Huebner's predictions come true the obvious implication is that current antifreezes are climbing toward oblivion. But several points must be considered before over-hasty judgments are made.

No one can now safely predict the extent that turbines will move into automotive applications; and there's considerable debate on how fast the transition to turbine engines from orthodox piston engines will take place.

Besides turbines there are other posers that are hard to answer about the future of lube markets, which right now are moving along very well. In fact, production of lubes, greases and fluid gear lubricants climbed well over a billion lbs. in '59, representing a 10% increase over '58. Sales in '60 are now estimated by industry sources to be about 8% higher than in '59—due partly to increased industrial as well as automobile chassis lubricating applications.

Meanwhile, there's considerable talk about nonmetallic, nongrease filled bearings (viz. bearings made of Du Pont's Teflon) and their ultimate impact on lube markets. Some observers say it's mostly talk, and cost factors will never be pulled down low enough to pose any real problem for lube marketers. On the other hand proponents of nonmetallic bearings are highly optimistic and insist that broad-scale use is imminent.

In summing up the auto chemicals outlook, most experts feel a markets change will surely take place. But many are convinced that the changeover will be gradual, giving CPI firms plenty of time to move their automotive chemical eggs safely into another basket.

Japan Buys Ortho

Japan will need 60,000 tons/year or more of imported ortho-xylene to make phthalic anhydride because naphthalene—traditional raw material for phthalic—is in short supply.

According to Japanese sources, the two biggest phthalic producers in Japan—Kawasaki Chemical and Nippon Catalyzer—are now negotiating for total imports of 60,000 tons of ortho-xylene from the U.S. Purchases reportedly will be made from Allied Chemical, Sinclair, and Oronite.

Currently under negotiation are deals by Kawasaki and Nippon Catalyzer to import all—reportedly 30,000 tons—of the ortho-xylene to be produced by Oronite by the end of '61. Reason: Oronite is on the Pacific coast, nearer to Japan than other U.S. ortho-xylene producers, which would mean reduced transportation costs.

A few weeks ago California International—an Oronite affiliate—completed its first shipment of ortho-xylene to Japan; delivery was to a Japanese trading firm, Toyomenka Kaisha, which will distribute the ortho-xylene to Nippon Catalytic in the Osaka area (*CW Market Newsletter*, May 14).

Carbon in the Black

U. S. output of carbon black jumped 20% in '59.

The big increase over '58's mark was shared by all producing areas except New Mexico. Channel black production declined 1%, but furnace black production increased 25%.

The U.S. Bureau of Mines reports that 41 carbon black plants were active last year, and several increased capacity, bringing total U.S. operating capacity to more than 5.76 million lbs./day—an increase of 128,400 lbs./day from Dec. '58.

Sales of carbon black increased 21% in '59, and the principal consuming industries upped their requirements by the following amounts: rubber 23%; ink, 17%; paint, 26%; exports, 17%; miscellaneous (mostly for steel and chemical plant requirements), 10%.

Total sales in '59 were more than 2 billion lbs., broken down as follows: rubber, 1.46 billion lbs.; ink, 47.3 million lbs.; paint, 13.8 million lbs.; miscellaneous, 7.8 million lbs.

About 513 million lbs. were exported.

More Capacity Coming? Earlier this year trade sources pointed up the brightening outlook for carbon black in '59 and '60, saw reason to expect a continued climb in demand and capacity (*CW*, Jan. 9, p. 55).

Stocks have been dwindling, and heavy demands are expected to continue through 1960, leading to need for more capacity. The general industry expansion is, in fact, now under way: Continental Carbon, for example, has been adding another 25 million lbs./year of capacity to its plant at Westlake, La.

Meanwhile Phillips Chemical plans to construct a 60-million-lbs./year plant near Orange, Texas—completion scheduled for the third quarter of '60. Columbian Carbon has also started a modernization and expansion program.

The capacity expansions are keyed to expected continued growth in demand for carbon black; but the increase may not be quite as big in '60 as it was in '59—best estimate now is for a 3-4% demand increase this year, compared to '59.

M A R K E T P L A C E

Aluminum Co. of America has started up its new \$80-million smelter at Warrick, Ind. Initially, one potline will be operated, will turn out 35,000 tons/year of metal; total capacity (five potlines) will be 175,000 tons/year. The other four potlines won't be completed until market demand warrants additional production.

Zirconium sponge production will resume at Columbia-National's plant at Santa Rosa, near Pensacola, Fla., by mid-June. The plant—run by the subsidiary of Columbia-Southern Chemical—was closed last December because the U.S. government questioned quality of the zirconium sponge then turned out.

Company personnel, working with the Atomic Energy Commission and the U.S. Navy, ironed out the technical problems, permitting resumption of production to supply a contracted 700,000 lbs./year (until June 30, '63) for AEC.

Butyl rubber is getting a tryout as a vapor barrier in building construction. A $\frac{1}{8}$ -in.-thick sheet of butyl rub-

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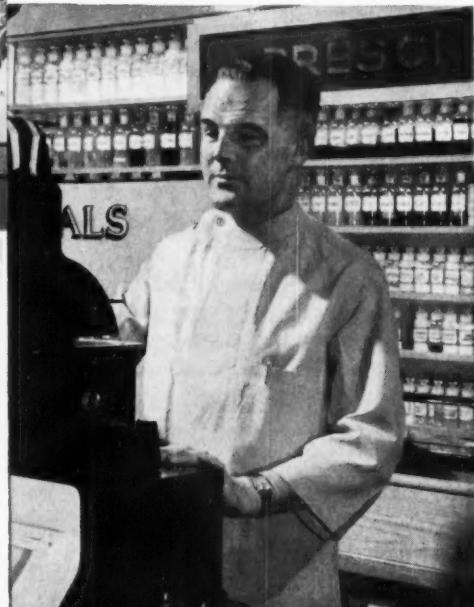
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MARKETS

ber went into the bottom of an excavation from which Humble Oil & Refining Co.'s new 44-story building in Houston, Tex., will rise.

A total of 230,000 sq.ft. of the butyl sheets—weighing more than 200,000 lbs.—will be used on construction of the office building and adjacent garage.

Government bids for 1.03 million lbs. of sodium orthosilicate, technical grade, will open July 5 (Bid No. CML-30-070-60-160). Material is to conform with Federal Specification P-S-00651B of the Army-Chemical Corps dated June 17, '59. The orthosilicate will be procured on an open-end-type contract, effective for a period of one year from date of award.

U.S. molybdenum concentrate production increased 24%, and consumption increased 20% in '59, compared with '58. Exports of molybdenum contained in concentrate and molybodic oxide were also 58% higher in '59 than in '58.

Alloys took the biggest part—about 13.5 million lbs.—of contained molybdenum used in the U.S. last year; additional amounts went into other steel products. Chemical uses included: pigments (ceramic and paint), 611,000 lbs.; other color compounds, 290,000 lbs.; catalysts, 236,000 lbs. Total demand in '59 was more than 32.3 million lbs. of contained molybdenum.

U.S. trade with the Latin-American republics generally appears to be declining. But, significantly, chemicals are making a comeback after a depressing '58 drop. That's the gist of a just-out report by the U.S. Trade Statistics Section of the Bureau of Foreign Commerce.

Total U.S. exports to 20 Latin-American republics in '59 amounted to a shade over \$3.5 billion, compared with nearly \$4.2 billion in '58, \$4.65 billion in '57.

The total export value of chemicals and related products, chemical specialties, drugs and industrial chemicals as a group, was \$724 million in '59, \$709 million in '58, \$779 million in '57.

The government experts also point out that trade in general had fallen off.

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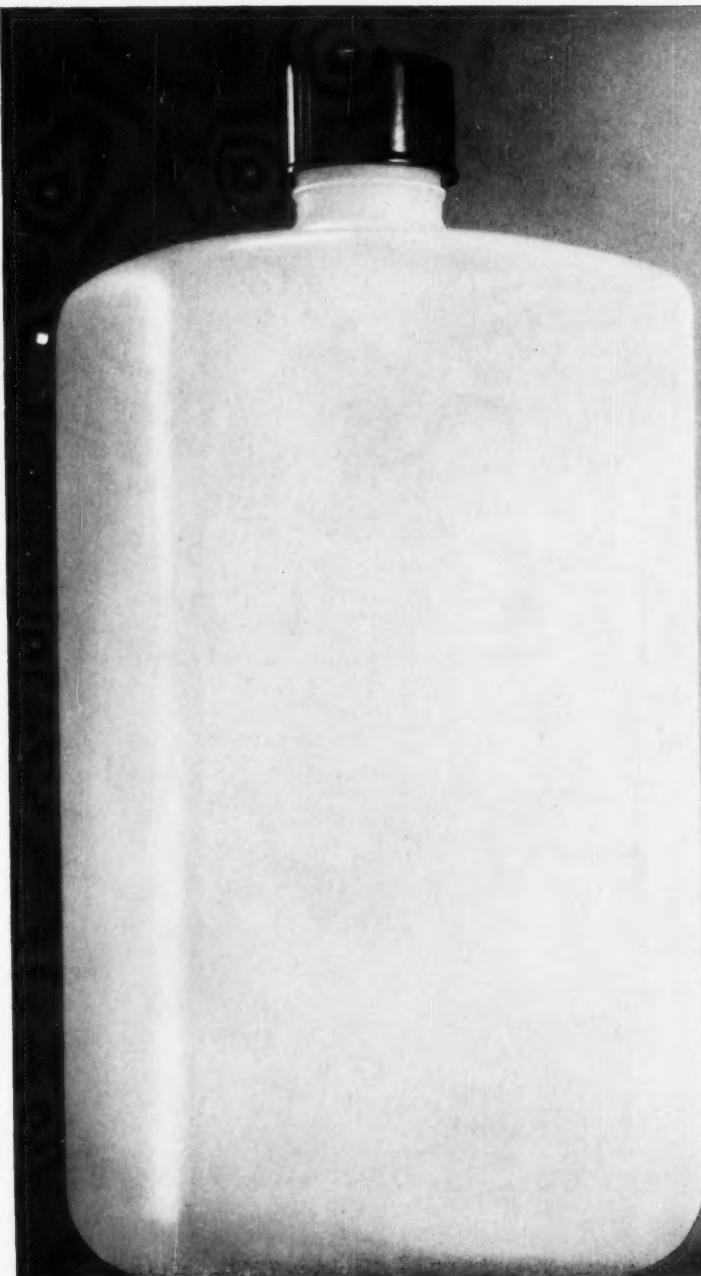
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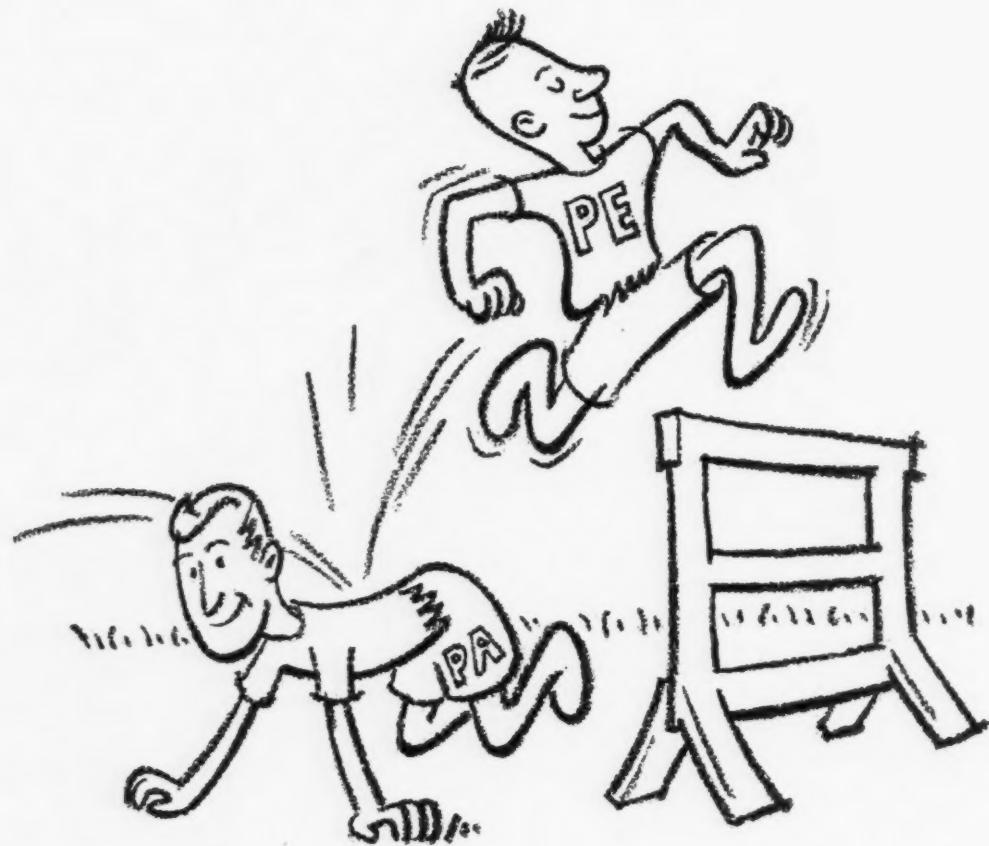
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Steel consultant Carl Zapffe runs through the lessons for distributors on stainless steel basics.

Strengthening Stainless Steel Sales Effort

Last week, as the steel industry bumped along at its slowest pace in six months, Republic Steel Corp. unveiled a \$1-million sales training program for its distributors, designed to blast stainless out of its sales slump. To CPI sales and purchasing management, the drive may bring both painful competition and a useful sales lesson.

The competition, of course, will be for plastics and nonferrous metals makers. Republic's move—reportedly the industry's most extensive sales effort ever lined up behind a single product line—means a stiff battle for the construction materials dollar.

Less obvious, but perhaps equally significant to CPI sales management,

is the example Republic's program provides in solving a knotty sales puzzle: how to upgrade the sales efforts of a far-flung distributor network. (Republic sells nearly half of its stainless through distributors.)

For Republic, the sales training program could hardly come at a better time. Stainless steel volume has suffered this year, as almost all steel products have, because of rapid inventory buildup after last year's strike.

There are encouraging signs that the steel business will pick up (see p. 44), but meanwhile stainless steel producers are moving to counter the aggressive sales tactics of plastics and aluminum makers that have cut into the stainless markets.

How It Works: Republic's program (dubbed Order Maker's Institute—OMI) calls for a 35-man team of its sales staffers to spread out over the U.S., visiting the home offices and branches of 50 of the company's distributors. The training course they'll give includes a series of nine conferences, with intervals of four to six weeks between lessons. Subjects to be covered: market data and applications, stainless steel technology and basic industrial selling principles.

Despite current selling problems, the market data these salesmen will take into the field indicates a relatively encouraging future for stainless. Example: the firm's market researchers expect a total stainless steel

SALES

market of some 11 million tons between '58 and '65, an average growth of 1.5 million tons/year.

That's a healthy jump over average production during the early '50s, when it was less than 1 million tons/year. Output last year totaled 1.13 million tons. The peak year was '56—1.26 million tons.

But the problem for Republic is how to cash in on this potential market. The company realizes that one of the main obstacles to greater sales in recent years has been lack of aggressive selling by its distributors.

In some cases, says Republic, this has taken the form of too little effort to learn what customers really needed and to make sure they got it. In other instances customers have been lost because they couldn't get from distributors all the technical information on stainless that they wanted.

But Republic's distributors are aware of these problems. They have stressed their need for more extensive product knowledge, particularly how to specify the correct material for a given job. And the distributors have pointed out that they want case histories of successful sales, dislike time-worn lists of selling points.

These are exactly the problems Republic's team of 35 top-notch salesmen can answer.

To improve product knowledge OMI sessions will be devoted to fundamentals of stainless steel, selecting the correct grade, fabrication methods. Republic sales management feels that course sessions on prospecting, practical salesmanship, creative selling and pricing should give the distributor sales staff needed sales know-how.

Heavy on Films: Republic is relying heavily on motion pictures to get much of its course material across to the distributors. The company has prepared 10 films to illustrate and enliven the conferences. One was shown recently to Republic distributors at the kickoff of the training program. The film featured Republic's top management speaking to the distributors.

In another film, Republic brings in Carl Zapffe (see picture, p. 123), Baltimore-based consulting metallurgist.

Telling the Consumer: Coinciding with the sales training will be a Republic program to step up the demand

for stainless steel—by telling consumers and key industrial buying influences about its wares. High-priced color movies will be used. For industrial consumers, Republic will use a film called "The New World of Stainless Steel," will show it to designers, engineers, architects, decorators and builders.

Other consumers will hear and see Republic's promotion of stainless in another film, "A New Look at Modern Living."

Stainless in the '60s: Doubtless, stainless steel makers are looking for greatly expanded markets in the '60s, despite tough competition from aluminum and plastics. And they realize, as never before, that their success in tapping the lush potential markets they've sighted on rests primarily on more aggressive selling—both by their own salesmen and by their distributor organizations.

And if the training program works and aggressive steps boost sales, it's a sure bet that makers of other construction materials will follow suit and further stiffen competition.

Worldwide LPG

Early next year, liquefied petroleum gas will begin moving to world markets via refrigerated tankers.

That's what Arabian American Oil Co. told CHEMICAL WEEK last week, as the company's pioneering \$6.1-million LPG refrigeration plant approached the half-complete mark. Site of the plant is adjacent to Arabian American's Ras Tanura refinery on Saudi Arabia's Persian Gulf.

Currently, Arabian American is selling about 3,000 bbls./month of pressurized LPG, has had pier facilities for exporting 1,500 bbls./month. Now the company is eyeing overseas markets, figures it'll have to refrigerate the gas to make tanker transport feasible.

Separate Streams: The new plant will have a capacity to refrigerate and store 4,000 bbls./day of liquefied propane and butane gas. Source of the gases: Aramco's alkylation and polymerization plants.

The company will keep the propane and butane separate all the way from the source at the refinery to the 80,000-bbls.-capacity storage tanks.

Users of the LPG will be able to specify pure propane or butane, or

a mixture of the two in any proportion.

After undergoing treatment for removal of sulfur and water, the gases will be stored at 32 F (butane) and -43 F (propane) prior to shipment.

Despite Aramco's plan to produce and ship refrigerated LPG, U.S. producers seem unconcerned—either about the relatively small amount of potential overseas competition it represents, or about the prospects for wider use in this country of refrigerated means of LPG shipping.

Enjay Adds Division

Enjay Chemical Co. now has a new Western sales division, headquartered in Houston, Tex. The move comes little more than a month after Enjay gained divisional status in Humble Oil & Refining Co., points up the growing role that chemical marketing now plays in the Humble organization.

Previously, Enjay Co. was a wholly owned subsidiary, controlled only part of Humble's domestic chemical marketing operations. But it has the whole job now, carries it out through three sales divisions—Western, Central and Eastern. It will form still another on the East Coast in the next year. With this organizational shuffle, Enjay hopes to maintain its 10-year average of 12% yearly sales growth—current annual sales top \$200 million.

Enjay figures its major growth in the years ahead will come primarily from new chemicals and products based on polypropylene, chlorinated butyl rubber, butyl latex and buton resins. New plants manufacturing these products will be built during the next year in the Gulf Coast area. To increase the breadth of its butyl and polypropylene applications, Enjay is investigating chlorobutyls and copolymers, is looking into the Montecatini copolymerization processes, too.

To implement this growth, the present sales force of 75 will be upped 50% in the coming year. Of the present staff, 15 were added in the past year, five from the former Humble Division. Technical service will also grow an estimated 35% in the next 12 months.

Plainly, Humble is betting that integrating its domestic chemical marketing operations under Enjay will aid in spearheading new growth in the petrochemical field.



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Colgate's automated warehouse fills orders faster, cheaper.

Automatic Order-Filling

This week Colgate-Palmolive Co. is working out the last kinks in its new punched-card, automatic warehouse in Kansas City, Kan. The system shown here automatically picks toiletry-article orders from instructions fed into the control system on punched cards, conveys cartons to one of six truck docks and into waiting trucks, totally without hand labor.

The new distribution center serves Colgate customers from Chicago to Texas. And already, says the company, the new system is permitting faster, more-accurate order filling, closer inventory control and cost saving over manual order picking.

Colgate stores 237 products in this warehouse, but only the 72 highest-volume items — representing 80% of the warehouse volume — are picked automatically. About 130 slower-moving items are stored on adjacent racks and are picked manually. The 35 slowest moving products are kept on shelves, apart from the automatic picking system.

At present, Colgate says, the system handles 9,000 cartons daily, but the full capacity is substantially above this figure.

Working Plan: For each order, a set of punched cards is prepared, representing items to be automatically handled. (The punched cards are also

used in inventory control and billing operations.) The cards are fed into a card scanner which reads, sorts and memorizes about 100/min. Time for an average order to be scanned: 10 seconds.

The electronic system then triggers the automatic picker into action. It handles about 50 cartons/min.

The 72 automatically picked items are stored in three decks of 24 items each, arranged one above another (see photo). As the cartons are picked, they slide down gravity conveyors to one of the three moving belts.

As the cartons move to the end of the moving belt, they slide onto a "hold-up" zone where the entire order is accumulated. The double lane in this "hold" zone allows a second order to be picked while the previous one is being processed.

Or, the hold zone allows manually picked items — sent through on printed orders rather than punched cards — to be added to the one automatically picked on the conveyor.

When an order is ready, it is automatically moved down a single conveyor to one of six truck docks, stenciled with the customer's name and address, then loaded into the truck.

Cost of the warehouse, though not disclosed by Colgate, is estimated at just under \$500,000.

Sales Force Shift

During the last two weeks four companies serving the glass and ceramic industries have jockeyed their marketing organizations (CW Business Newsletter, June 11).

Lithium Corp. of America has appointed U.S. Borax & Chemical as sales agent for its lithium carbonate and other lithium compounds used in the manufacture of glass and ceramics. American Potash & Chemical Corp. will cooperate with James H. Rhodes Co. (Chicago) to sell AP&CC's rare earth-based glass and ceramic polishes.

Lithium Corp.'s hookup with U.S. Borax adds impetus to LCA's return last January to the commercial selling of the lithium compounds after an absence of three years. The absence was caused by a five-year government contract that prevented LCA from manufacturing these compounds at competitive prices.

The new arrangement will allow LCA to sell its compounds throughout the U.S. and in Canada, Cuba, Puerto Rico and Mexico. LCA will use U.S. Borax's 25-man sales staff serving the glass and ceramics industry — a team that will benefit by being able to offer lithium as well as boron chemicals. USB's chief competitor, AP&CC has already been in this position for some time.

Rare-Earth Men: AP&CC gains from Rhodes' 65 years of experience in the glass polishing field. The firm makes polishing equipment such as pumice stones, rouge and felt.

The two aim to increase use of rare earth-based polishes mainly in the making of plate glass, but also in the optical and flat-glass field.

Under the new setup, Rhodes and AP&CC will jointly sponsor a glass polishing research and applications laboratory at Rhodes' Chicago headquarters, and AP&CC's 35 glass polish distributors will order directly from Rhodes. S. Becker Treat, who received these orders as American Potash's manager of polishing products, will change over and receive them as Rhodes' vice-president of glass-polishing sales and research.

The Lindsay Division of AP&CC, which makes these polishes, will continue its own optical research laboratory program of product development, quality control and technical assistance.



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**JEFFERSON
CHEMICALS**

Soo Sets New Rate

The Soo Line railroad, pioneer of the guaranteed or "agreed" rate, has instituted another precedent-setting tariff—this one covering the first joint rail-pipeline rates for transporting Montana and North Dakota crude oil. And the Soo plans to go after new fuel oil business next week with another agreed-rate tariff in Michigan.

Under the unique joint tariff Soo recently filed with the Interstate Commerce Commission, the railroad will haul crude oil from Montana and North Dakota producing wells to the Clearbrook, Minn., terminus of the Minnesota Pipeline Co.'s line. From there, the oil will be pumped to refineries in the Minneapolis-St. Paul area.

The joint rate for both legs of the haul is 70¢/bbl., compared with 84¢/bbl. previously charged by Soo for the entire haul in its tank cars.

Behind the Move: Main reason for Soo's activity is Great Northern Railway's threat to build a pipeline from the Dakota oil fields all the way to the refineries in the Minneapolis-St. Paul area. Such a pipeline would, of course, cut off most of the Soo's current crude oil traffic.

Great Northern's plans for the pipeline have been known for some time and the North Dakota Public Utilities Commission not long ago granted its approval of the project.

But the Great Northern continues to hold up on the pipeline, has recently offered a plan for a 69.7¢/bbl. all-rail rate for Dakota crude.

However, Soo figures it will continue to get a considerable share of crude oil traffic, despite Great Northern's lower rate. Reason: Soo contends that refiners prefer to receive their crude via pipeline since it costs about 5¢/bbl. more to unload oil from tank cars.

The new tariffs by Soo and Great Northern mean substantial savings for shippers in the Montana, North Dakota, Minnesota area. Based on Soo's early June volume of 7,140 bbls./day (300,000 gal.), savings top \$1,000/day.

It's too early to tell whether Great Northern will soon start building its pipeline, or whether someone else may step in and do it. But it's a good bet that refiners and producers welcome the lower rates, will be watching closely for more of the same.

DATA DIGEST

• **Machining Fluorocarbons:** New 12-page booklet offers fundamentals on machining fluorocarbon resin shapes. Subjects covered: stress relieving, tool speeds and feed rates, angles and clearances, surface finishes and tolerances. Raybestos-Manhattan, Inc. (Manheim, Pa.).

• **Thermoform Molds:** Technical bulletin describes materials of construction and design features recommended for thermoform molds in which high-density polyethylene is molded. Phillips Chemical Co. (Bartlesville, Okla.).

• **Tin:** Industrial uses of tin and its alloys and compounds are discussed in booklet. Other subjects covered: tin ores, organotin compounds, white metal and babbitt metal. The Malayan Tin Bureau (2000 K St. N.W., Washington 6, D.C.).

• **Corn Chemicals:** Folder describes chemical products available from corn. Among them: phytic acid, glucuronolactone, inositol, polyoses, methyl glucoside and sodium phylate. Corn Products Sales Co. (10 East 56th St., New York 22).

• **Polyvinylpyrrolidone:** Booklet (AP-98) discusses uses of polyvinylpyrrolidone in formulating cosmetics, toiletries, pharmaceuticals, veterinary products, soaps and detergents, adhesives and coatings. Antara Chemicals Division, General Aniline & Film Corp. (435 Hudson St., New York 14).

• **Diatomite:** Bulletin discusses properties and uses of diatomaceous earth in paper making and filtration of paper mill waters. Great Lakes Carbon Corp. (612 South Flower St., Los Angeles 17).

• **Cryogenic Gases:** Two cards, one 8½ x 11 in., the other wallet-size, listing the physical properties of over 30 cryogenic gases are available. Air Products, Inc. (Allentown, Pa.).

• **Organic Chemicals:** Ring-bound booklet presents properties and specifications of cresols, xylenols, phenols, higher boiling phenols and cresylic acid. Productol Co. (417 South Hill St., Los Angeles 13).

• **Protective Coatings:** New booklet covers properties, uses, end-use specifications and packaging of coal-tar-based protective coatings produced by Plastics and Coal Chemicals Division, Allied Chemical Corp. (New York).

• **Powdered Polyethylene:** Brochure outlines uses of powdered polyethylene in various coating and molding applications. Resin can be applied in powder, paste or dispersion form. U. S. Industrial Chemicals Co., division of National Distillers and Chemical Corp. (New York).

• **Natural Rubber:** Technical bulletin discusses compounding natural rubber for low-temperature (to -60 C) uses. Methods used: incorporation of plasticizers, chemical modification of the natural rubber. Technical Service Dept., Natural Rubber Bureau, 1631 K Street N.W., Washington, D.C.

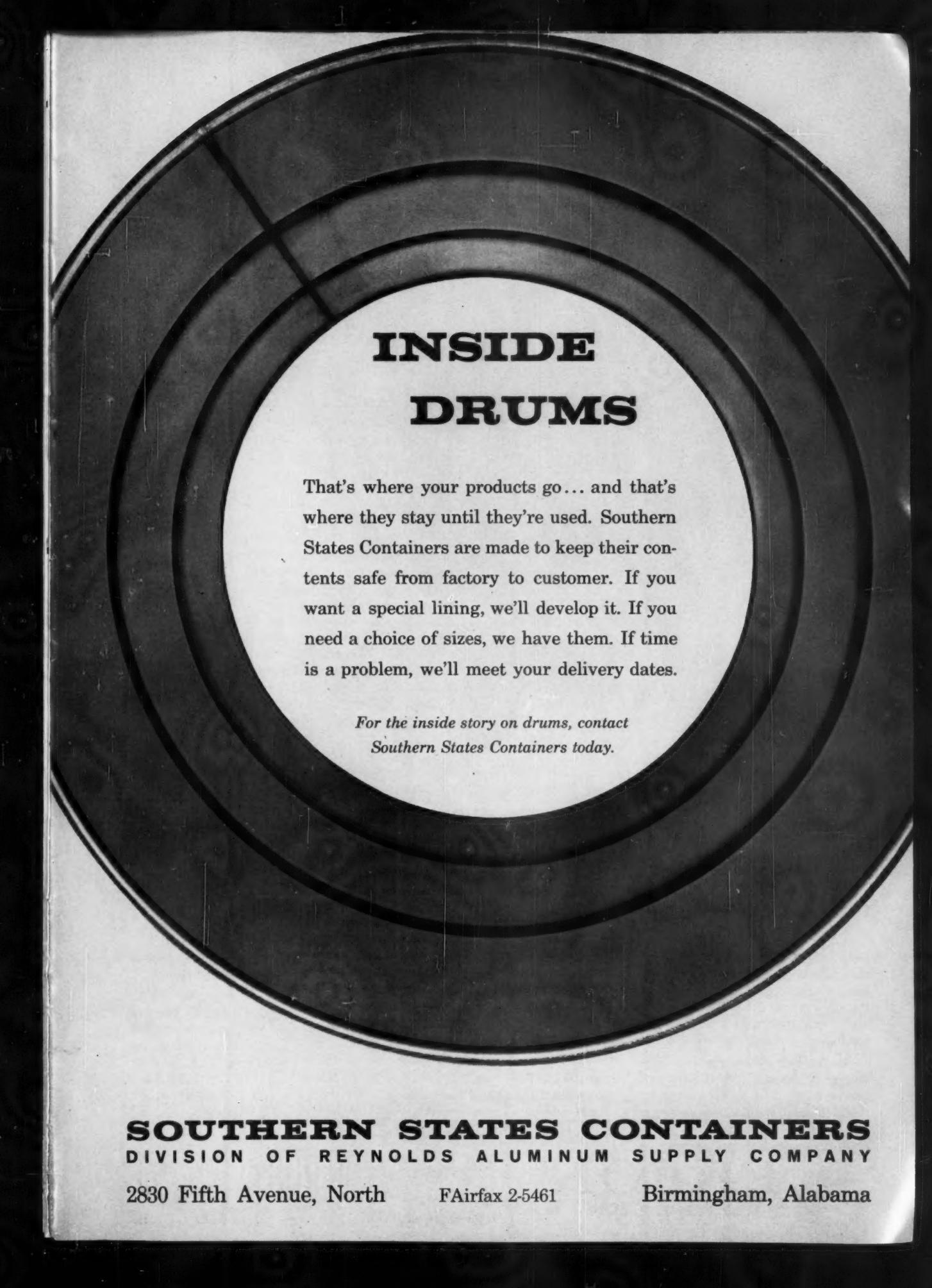
• **Chromium Chemicals:** New 80-page bulletin outlines properties and uses of industrially important chromium chemicals. Examples: chromic acid, sodium and potassium chromate, potassium and ammonium bichromate. Analytical and handling methods are also discussed. Advertising Section, Solvay Process Division, Allied Chemical Corp. (New York).

• **Laminating Guide:** New 24-page booklet outlines materials, equipment and production techniques used in laminating diallyl phthalate (Daponite) plastic materials. Chemicals and Plastics Division, Food Machinery and Chemical Corp. (161 East 42nd St., New York 17).

• **Boron Products:** Twenty-four-page brochure presents data on the production, properties and uses of boron compounds. Also described: history of borax, location of major sources, boric acid specifications, listing of thirty boron chemicals now available in research quantities. Stauffer Chemical Co. (380 Madison Ave., New York 17).

• **High-Purity Gases:** Booklet details the properties, applications and storage considerations of ultrahigh-purity gases. Those included: argon, neon, helium, krypton, xenon, radioactive gases and special mixtures. Typical uses: protective atmospheres, insulators, refrigerants, radiation sources and easily ionizable materials. Linde Co. Division of Union Carbide Corp. (270 Park Ave., New York 17).

• **Urethane Foams:** Brochure describes techniques for producing urethane foams for low-temperature insulation, shockproof packaging, marine flotation, cushioning and electronic component encapsulation. Isocyanate Products, Inc. (900 Wilmington Rd., New Castle, Del.).



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Market Newsletter

CHEMICAL WEEK

June 18, 1960

Coal chemicals are back in the spotlight this week.

Effective July 1, the split price on naphthalene will be eliminated when Koppers will hike its price to 6¢/lb., in line with moves by other industry producers. Since April 1, several companies, including U. S. Steel and Allied, have been quoting the 6¢/lb. tab, while Koppers held at 5¢/lb.

Repercussions of the increased naphthalene tabs will be felt by consumers of phthalic anhydride. Currently, several price schedules are in effect for phthalic: Koppers and American Cyanamid, 17¢/lb.; Pittsburgh Coke, 18¢/lb.; Monsanto, Allied and Witco, 19¢/lb.; Reichhold, 21¢/lb.

Starting July 1, however, the industry will move back to a more uniform price schedule on phthalic, when Koppers, American Cyanamid and Pittsburgh Coke bring their prices in line with the higher 19¢/lb. tabs. No changes have been reported by Reichhold.

Phthalic plasticizer prices will also move up, due to naphthalene's price hike. Union Carbide has already reported it will increase tabs on phthalic plasticizers July 1. Products affected include dibutyl phthalate, dimethyl phthalate, and Flexol plasticizers 380, 426, 810, 1010 and CC-55, and dioctyl phthalate (DOP). Tank-car prices for DOP will be increased 1¢, to 26¢/lb., delivered, East Coast. Western prices are 1½¢/lb. higher at 27½¢/lb.

Pittsburgh Coke is reportedly ready to increase its prices of phthalic plasticizers, and others no doubt will boost quotes on their products.

New interest by oil companies to produce naphthalene via a petroleum route will doubtless be sparked by higher tabs on coal-derived naphthalene. Just this week, for instance, Sun Oil disclosed that it will go ahead with a new, \$8-million plant at Toledo, O., to make petroleum naphthalene. The 100-million-lbs./year-capacity plant is expected to be in operation by the end of '61. Sun reports the entire plant capacity is under long-term domestic contracts, and all shipments will be by tank car on tank trailer.

Earlier this year, Ashland Oil & Refining reported plans to build a 75-million-lbs./year naphthalene plant and 15-million-gal./year benzene unit next to its refinery at Catlettsburg, Ky. (*CW Business Newsletter*, April 23, p. 31). Last week Ashland awarded the construction contract to Badger Manufacturing Co. Expected completion for the new unit is Feb. '61.

Petroleum benzene output is moving at a high rate. Despite a reduction in crude runs, petroleum producers are turning out record quan-

Market Newsletter

(Continued)

tities of benzene. Reason: heavy demands for benzene are encouraging producers to squeeze out more production from existing facilities; at the same time more marginal producers are getting into the act.

But the industry doesn't go along with the production figure of 30 million gal. of petroleum benzene reported by the Tariff Commission for March, says it is too high. **CHEMICAL WEEK** learns that this tally will be revised downward, although the final figures are expected to top the 25-million-gal. mark.

More Canadian hydrogen peroxide capacity is on the way. Canadian Industries Limited will expand operations at its Hamilton, Ont., unit, expects to be onstream by the first of the year. Reason given for the move is heavy demand for hydrogen peroxide by the pulp and paper and textile industries.

A 4-million-lbs/year anhydrous aluminum chloride plant is now onstream in Canada. The new unit, located on a 20-acre tract at Sarnia, Ont., is operated by St. Clair Chemical Limited, a wholly owned subsidiary of Clinton Chemical Co. (Phillipsburg, N.J.). It's believed to be the first Canadian plant producing this catalytic chemical.

Also add polyethylene film to new Canadian production facilities. Union Carbide Canada is now operating its plant at Cowansville, Que. The new unit will increase the company's polyethylene film production potential in Canada by 50%.

Dihydroxydiphenyl sulfone capacity has been more than doubled at Monsanto's Krummrich Plant at St. Louis. The new unit is engineered to turn out the higher-quality (finer mesh size, greater solubility) material. Major use for the chemical intermediate is in tin plating, to achieve more uniform coating. Smaller applications include an additive for manufacture of phenolic resins, and antioxidant for polyvinyl chloride resins.

Allied Chemical will change its pricing system on urea, effective July 1. According to Malcolm Hunter, sales vice-president for the Nitrogen Division, all agricultural and industrial grades of urea will be priced f. o. b. production points, rather than on a delivered basis.

F. O. B. points will be South Point, O., and La Platte, Neb., with the delivered cost being equalized against competitive producing plants. Under the new pricing, all grades of Arcadian urea fertilizer will be \$98/ton; Procadian urea feed mixture, \$100/ton, industrial grades of crystal urea and uncoated pelleted urea, \$100/ton.

Other companies are now studying the new schedules, and it appears that they will probably go along with the changes to remain competitive.



Hidden Opportunities in the European Chemical Markets

by Robert S. First and William D. Gersumky

Smaller European companies are eager to do business with U.S. chemical companies. But they seldom see an American visitor. Here's who they are.

The U.S. chemical executive flying to Europe this week will traverse a familiar beat. Odds are long that he'll visit such well-known companies as Solvay, Montecatini, ICI, Pechiney and Hoechst. But if he confines his visits to these European giants, he will be missing 863 bets.

For there are at least that many alert, medium- and small-sized companies in Belgium, Holland, France, Italy, Sweden, Switzerland, the United Kingdom and West Germany (see list, p. 144). It's no exaggeration to call them the "hidden opportunities" in Europe.

The contributions of the big European companies, of course, cannot be minimized. But the very fact that

the firms are big and famous means that they're visited by visitors from the U.S. They've already established lines of communication with, or cooperation with, U.S. companies in important areas. Moreover, most of them have either U.S. affiliates or offices.

Some of the smaller companies, on the other hand, seldom see a chemical executive from the U.S. Yet most of the companies listed do over \$2 million worth of sales a year. They have top-notch research and marketing organizations, are eager to enter into agreements with U.S. companies.

A number of these companies are not well known

Visitor's Map to Europe's CPI

in the U.S. because they are somewhat remote geographically. Few chemical men touring Europe, for example, include Sweden in their itineraries. But there are over a score of important Swedish chemical producers.

Some are ignored because their main field of interest lies outside the chemical industry proper (e.g., in steel, paper or petroleum). But they have substantial chemical production as well.

There's another incentive for doing business with small European companies. They have lacked the funds for a sustained research and development effort. Yet either on their own or through cooperative research, they have done some significant work. Moreover, until the Common Market becomes a more effective force, they have, in many cases, only small national outlets for some of their products. Result: they've been relatively slow to commercialize their work. And that means U.S. chemical companies can find a fair amount of research waiting to be exploited.

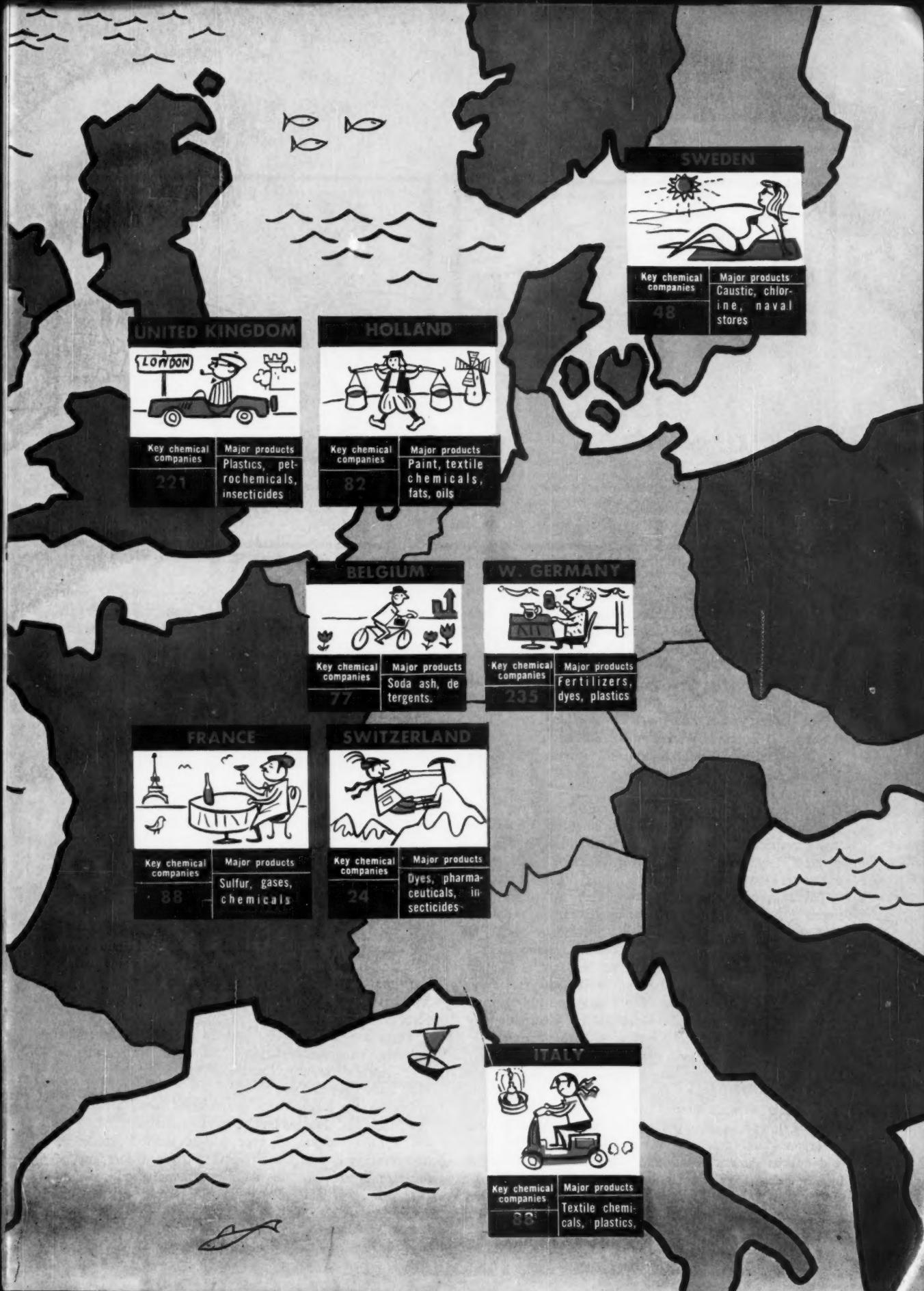
In any case, the best way to appreciate how these medium and small companies fit into the European pattern is to take a brief look at the makeup of each country. On this and following pages, is sketched an outline of each country's chemical industry. The 863 companies listed at the end is not a complete directory of all the medium- and small-size companies in the eight countries. But it's based on over 1,100 personal calls by the authors over the past two years. And it contains a number of firms that should be worthy of cultivation by U.S. chemical men.

HOLLAND

Over 500 companies in Holland are engaged in some chemical activity. The nation has a well developed paint and varnish industry, enjoys a high per-capita consumption of paint. An old, established and efficient leather industry in Holland accounts for the fast-moving group of companies producing textile and leather chemicals. There is also a big, well-established vegetable oil and fat industry, which got its start largely from the vegetable and seed estates of the former Netherland East Indies.

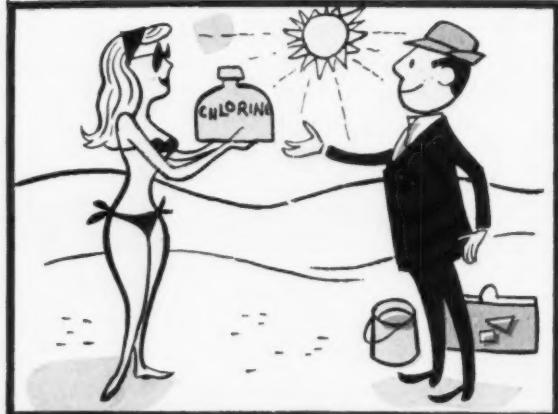
Staatsmijnen in Limberg (government-owned) and N.V. Koninklijke Nederlandsche Zoutindustrie (K.N.Z.) are probably the largest and best known chemical companies in Holland. Staatsmijnen produces ammonia, ammonia derivatives, phthalic anhydride, polyethylene, naphthalene, and a range of other chemicals and polymers. K. N. Z. produces chlorine, caustic soda, insecticides, sodium hy-







"Holland is almost an ideal country for the U.S. chemical businessman."



"The Swedish chemical industry is characterized by specialization."

drosulfite, monochloroacetic acid, and other products. It recently became one of the most powerful chemical complexes in Europe with the acquisition of Albatros Superfosfatfabriken N.V. of Utrecht, and Chemische Fabriek Gembo N.V. of Winschoten. The former is a large fertilizer producer while the latter company produces organic chemicals, solvents, and coatings.

The largest paint companies in Holland are Pieter Schoen and Zoon, N.V., Zaandam; Sikkens Lakfabriken, N.V., Sassenheim; Koninklijke Lak-Vernis-en Verffabriek Molyne & Co., N.V., Rotterdam; and Vernis-en Verffabriek VH. Vettewinkel & Zonen, N.V., Amsterdam. While these companies are all smaller than the large U.S. paint manufacturers, they are first-rate companies in all respects and produce quality products in efficient plants. They possess high-caliber research staffs, have sound technical service and marketing organizations.

There have been many joint-venture agreements between U.S. and Dutch companies. Examples: Godfrey L. Cabot, Inc. and Koninklijke Zwavelzuurfabriek V/H Ketjen N.V. in carbon black; American Cyanamid Company and Koninklijke Zwavelzuurfabriek V/H Ketjen N.V. in petroleum catalysts; and B. F. Goodrich and A.K.U. in synthetic rubber. More will probably spring up since Dutch chemical executives are internationally minded and receptive to cooperative arrangements.

One of the lesser known, but one of the fastest-moving Dutch chemical companies is Koninklijke Industrieel Maatschappij V/H Noury & Van der Lande of Deventer. It produces a wide variety of ethical and proprietary pharmaceuticals, is an important factor throughout Europe in organic and inorganic peroxides. In 1928 the firm sold out its American subsidiary to Wallace & Tiernan Inc., and this was the beginning of the latter's production

of peroxide catalysts in the U.S. Other activities of Noury & Van der Lande include catalysts, stabilizers, detergents, and lacquers and varnishes. It has subsidiaries or affiliated companies in France, Germany and the United Kingdom, as well as in Holland. The parent company has a sales volume of over \$25 million/year.

Holland is almost ideal for American businessmen. The people are friendly, fast and efficient. Almost every business executive speaks English fluently. In addition, Holland has an excellent transportation industry.

SWEDEN

The Swedish chemical industry is characterized by a great deal of specialization. A significant portion of the Swedish chemical industry is related to papermaking: chemicals for paper manufacture and by-products of timber, pulp, and paper. Thus there are large producers of sulfite, chlorine, caustic, naval stores and wood distillation products.

Explosives, including matches, is an old industry in Sweden. Its importance dates back considerably before the time of Alfred Nobel. In recent years explosives and matches have accounted for as much as 10% of total Swedish chemical output.

There are some notable gaps in the Swedish chemical industry. The country has no coal or oil, so there is no petrochemical industry, and not much in the way of dyes and coal-tar chemicals.

One of the larger, very progressive Swedish chemical companies is Stockholms Superfosfatfabriket A.B. It has a sales volume of over \$19-20 million. Its scope of operation is somewhat remarkable for a company of this size. It manufactures PVC resins, and produces mel-



"Swiss terrain concentrates production, means almost unlimited water power."



"The French chemical industry has always liked joint enterprises."

amine under license from Ciba. It also makes phosphates, fatty acids and derivatives, perchlorates, acrylic fibers, and silicon metal.

Another important company, although not too well-known in the United States, is Skanska Attikfabriket A.B., in Perstorp. Skanska is an important producer of wood distillation products, and formaldehyde and derivatives, including pentaerythritol, hexamethylenetetramine, methylal, and formaldehyde sulfoxylates. In addition, the company offers a wide range of thermosetting resins including melamines, ureas, and polyesters.

Some of its resin production is captive for such items as glass-reinforced polyester in tote boxes, crash helmets, and appliance parts, melamine dinnerware and decorative laminates.

SWITZERLAND

Switzerland, in addition to being small, is quite lacking in mineral resources, and its terrain precludes any great agricultural development. Industry is therefore one of its main sources of wealth; and although mountains necessitate the concentration of industrial production, power from hydroelectric schemes is almost unlimited.

The Swiss chemical industry is dominated by three large companies: Ciba AG., Sandoz AG., and J. R. Geigy AG., all of Basel. All three have manufacturing associates in the United States, and in general their research effort is directed toward the development of products to be manufactured in their plants in Switzerland or in the United States.

The influence of the three leading companies is extended by the fact that they hold the majority, and in some cases all, of the shares of a number of other chem-

ical companies, such as Durand & Hugenin AG. and Saurefabrik Schweizerhall.

One important independent Swiss company, much less known in the U.S. than the "Big Three," is Holzverzuckerungs AG. of Zurich (Hovag). This company produces methanol and formaldehyde, urea, ammonia, cyclohexanol and cyclohexanone, caprolactam, dimethyl sulfate and other products. It employs about 1,000.

Hovag controls Inventa AG. (Lucerne), a chemical engineering and patent-holding subsidiary. It developed the process for making urea used by Sohio at Lima, O. In addition, Inventa has developed a reportedly economical system for separating unreacted carbon dioxide and ammonia. Vulcan Engineering Division, Vulcan-Cincinnati, Inc. (Cincinnati, O.), has been licensed to erect plants under these Inventa patents.

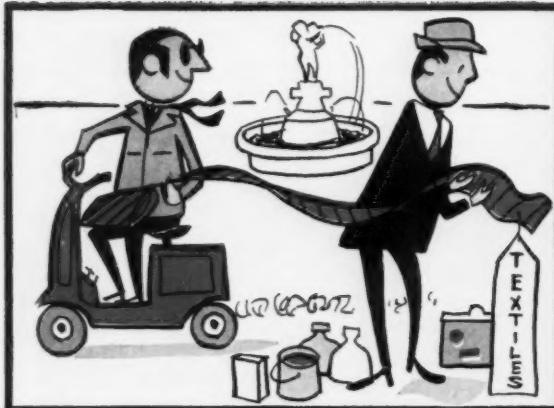
Inventa also has processes for caprolactam, nylon 6 and for methanol.

Associated with it is Fibron, S. A. (Domat-Ems), engaged in the production of nylon and rayon fibers.

FRANCE

The French chemical industry is growing rapidly. Over the past five years the average compound rate of growth has exceeded 20% a year.

The 10 largest chemical companies are Esso-Standard, Kuhlmann, Naphtachimie, Organico, Pechiney, Petrols B.P., Petroles d'Aquitaine, Rhone-Poulenc, St. Gobain and Ugine. Of the top 10, two (Esso and Petrols) are oil companies with big petrochemical interests and one (d'Aquitaine) is the state-owned organization for controlling natural gas and sulfur production from the gas wells at Lacq. (The important Solvay and Solvic companies



"With few exceptions, Italian chemical companies are relatively young."



"At least 250 German chemical companies have sales over \$2 million."

are not included here because they are controlled from Belgium.)

The French chemical industry is characterized by a high degree of interlocking ownerships. This trend toward joint ownership got started with the growth of the nitrogen fertilizer industry when coal and chemical companies teamed up. Some of these have gone on to make other chemicals. Courrieres-Kuhlmann, for example, now makes lighter oxo alcohols.

Most of the other big groups have followed the example of the coal and chemical firms. For instance, Pechiney is linked with Progil in Pechiney-Progil; Shell with St. Gobain in Shell-St. Gobain; Ugine with Progil in Progil-Electrochimie; Kuhlmann and Pechiney with Petrols in Naphtachimie.

All told, there are approximately 90 French companies with a sales volume of over \$2 million/year. Many of these, though smaller than the top 10, are familiar to U.S. chemical men. Good examples of these would be L'Air Liquide and Progil.

But there are a number that are not quite so famous. And many of them are developing a steady stream of new chemical processes and products.

One such company is Societe Francaise d'Organosynthese. This company is affiliated with Laboratoires Roger Bellon, the third largest pharmaceutical house in France. Originally concerned with pharmaceuticals and fine chemicals, it now devotes most of its attention to development and production of such basic items as rubber chemicals (peptising agents and anti-oxidants), curing agents for epoxy resins, photographic chemicals, plasticizers, emulsifiers, optical bleaches, ultraviolet absorbers. Organosynthese has licensed a number of processes and products to United States companies. For example, it

has a cross-licensing arrangement with Catalin Corp. in anti-oxidants.

Another noteworthy small company is Societe de Produits Chimiques et de Synthese (Bezons). Back in 1945 this little company was engaged solely in manufacture of shoe polish. Since then, however, it has built up a significant chemical operation. Today products include vinyls, plasticizers, stabilizers, colorants, sebacic acid, sequestering agents, surfactants, optical bleaches, and synthetic lube oil additives. Its only tie with a U.S. company is an arrangement to sell in France some of Armour's amines and amine derivatives.

ITALY

With the exception of Montecatini and a few others, most Italian chemical companies are relatively young. A number of foreign companies, such as Ciba, Sandoz, Solvay and Unilever, have Italian subsidiaries.

Italy has a well-established textile industry and is also a large producer of pesticides, especially insecticides and fungicides. This has created a large demand for emulsifiers, and while some of these are imported, there are also important producers in Italy.

With the exception of the Montecatini group, there is no high degree of concentration or interlocking in the Italian chemical industry, such as is found in the French and Belgian chemical industries. The Montecatini group:

Montecatini S.p.A.
IMAD, Industrie Meridionali Azoto e Derivati
A.E.&C. Bianchi, Sta. Chimica Lombarda S.p.A.
Soc. Ital. del Litopone
Polymer Industrie Chimiche S.p.A.



"Central control, interlocking directorates are the rule in Belgium."



"A striking feature in Britain is the large number of subsidiaries."

Aziende Colori Nazionale Affini S.A.

Vetrocote S.p.A.

Sta. Rhodiatoce (joint subsidiary with Rhone-Poulenc)
Farmitalia, Sta. Farmaceutici Italia (joint subsidiary with Rhone-Poulenc).

Because the Italian chemical industry is relatively young, few new chemical processes and products have been developed. So Italian chemical companies have been predominantly buyers of licenses and processes rather than sellers. However, they've been devoting considerable effort to developing technology of their own, and results should be soon forthcoming.

One alert Italian company, not widely known in the U.S., is Anic S.p.A. (Milan). It has a fair-size research establishment, which has been operating for about two years. Main activities lie in the fields of petrochemicals and fertilizers. (It's a significant producer of acetylene from natural gas.) The firm also makes soap, detergents, synthetic rubber, refined and hydrogenated fats and oils.

In 1958 Anic began operation of a new plant in Ravenna, making over 100,000 tons/year of nitrogen from natural gas. At the same site, it makes 15,000 tons/year of vinyl chloride in a joint venture with Wacker-Chemie, A.G., of Munich (Societe Chimica Ravenna). A large vinyl chloride customer, Wacker-Chemie now has a 51% interest in the project.

Also interesting is Ledoga, S.p.A., of Milan. An aggressive company engaged in the production of organic chemicals and surface-active agents, Ledoga formerly was an important producer of gallic and pyrogallic acids. In recent years, however, it has given an increasing amount of its attention to sucrose esters, itaconic acid esters, furfural, and derivatives.

In 1958 the company formed a joint firm with Snia Viscosa (Milan) called Italiani di Recherche Chimice. This offspring produces itaconic acid under license from Pfizer and is researching itaconic acid esters. One result of this program: Dialux, a thermoplastic said to have excellent light transmission, high melting point, surface hardness. It's intended to compete with methyl methacrylate resins in some applications.

GERMANY

Although the three splinters of I.G. Farben—B.A.S.F., Bayer, and Hoechst—are still the biggest and most important units in the German chemical industry, there are at least 40 German chemical companies having a capital of DM 10 million (\$2.5 million) or over. Included: Chemische Fabrik Kalk, Chemische Werke Huels, Kali-Chemie, Knapsack-Griesheim, Ruhrchemie, and Wacker-Chemie. In all, there are probably more than 250 companies in West Germany with annual sales volume over \$2 million, whose activities are wholly or largely devoted to chemicals.

The German chemical industry is so large and so well developed in almost all branches that it is difficult to discuss it in terms of specialization. Germany was, of course, first in the field of synthetic-nitrogen fertilizers and still maintains a dominant position. Many of the synthetic gasoline plants, built before or during the war, were bombed or dismantled. Some plants, however, like the Huels synthetic rubber facility, are still in production. Germany was also one of the earliest countries to develop an electrochemical industry; and although some of the biggest plants are now in East Germany, Knapsack-Griesheim and Suddeutsche Kalkstickstoff remain big



producers of carbide chemicals and Elektrochemische Werke of Munich is an important producer of hydrogen peroxide and organic peroxides.

A number of relatively small companies have become important through specialization in one product or in one family of products. Examples are Oxydo of Emmerich (organic peroxide catalysts and accelerators), Phenolchemie (cumene process phenol and acetone), Rhein-Chemie (rubber chemicals), and Riedel-de Haen (vanillin and derivatives). Many of the 235 companies listed possess high-caliber research and development organizations, are engaged in studies and operations potentially significant to U. S. companies.

It's not possible to discuss them all, of course. But one company deserving mention is Henkel & Cie. GmbH (Düsseldorf). Henkel produces fatty acids, alginates, synthetic glues, detergents, degreasing compounds, disinfectants, glycerin, paints, synthetic resins, and sodium silicate. And it is one of the largest producers of alkali and synthetic detergents in West Germany. It has done considerable work on the production of terephthalic acid from benzene and toluene.

Also worthy of note is Riedel-de Haen, AG. (Seelze bei Hannover), 75% owned by Leopold Cassella, the fourth and smallest of the former I.G. Farben companies. Since Cassella is itself 25% owned by each of the other three members of the I. G. Farben group, Bayer, BASF, and Hoechst, there is a close interconnection and a considerable amount of mutual exchange of technology and materials. Riedel, however, specializes in production of small-volume chemicals, such as stabilizers and inhibitors. It produces a wide range of organic and inorganic chemicals, including alkyl halides, succinic anhydride, amyl acetate, citrates, lactates, oxalates, and essential oils. Inorganic chemicals include caustic potash, manganese salts, lead salts, selenium salts, sulfur, and vanadium salts.

In spite of its connection with Germany's chemical giants Riedel operates fairly independently in a number of areas, such as plastics, electroplating and electrochemicals. It produces some pesticides in conjunction with Rohm & Haas. It also produces highly specialized inorganic materials, such as crystals for optical instruments. Other specialties include pyrazolones and wide range of 8-hydroxyquinoline derivatives. A number of pyrocatechol derivatives are also produced. And work is being done in detergents, specialty catalysts and anti-oxidants.

BELGIUM

While Belgium is certainly not a large country, there are over 400 companies in the Belgian chemical industry. However, most of these are small and only 20 or so have as many as 500 employees.

By far the largest unit in the Belgian chemical industry in terms of capital is Solvay & Cie. This company was, of course, a pioneer of the ammonia-soda process for alkali manufacture. It has extensive interests in alkali works throughout Europe and maintains close links with

ICI. Solvay also entered the polyvinyl chloride field soon after World War II, and through its associate company, Solvic, and associates in France, Germany and other European countries, is among the leading producers of PVC and vinyl chloride copolymers. Solvay et Cie. was one of the original participants in the formation of the giant Belgian combine, Union Chimique Belge.

Another large Belgian chemical company: Societe Belge de l'Azote and Huilever. Of roughly the same size is Gevaert, whose principal interest is in films, and Hoboken, primarily concerned with nonferrous metals. Smaller, but still important, companies are Ammonique Synthetique et Derives, Carbochimique Limbourg, Remy, Sidac, and Titane. The largest explosives company in Belgium is Fabrique Nationale de Produits Chimiques et d'Explosifs. Societe Belge de l'Azote et Produits Chimiques du Marly is the most important producer of nitrogenous fertilizers. Most of the industry is centralized around Brussels and between Ghent and Antwerp, although Liege is also an important chemical center.

There is a certain amount of specialization in the Belgian chemical industry. Apart from alkali, Belgium is important in nitrogenous fertilizers, gelatine and related materials, as well as paint and varnish. Of the more than 400 companies having chemical operations in Belgium, the authors have visited 77, all of whom have a sales volume in excess of about \$2 million/year, and as a group certainly represent the heart of the industry in Belgium.

It should be pointed out that, while there is no government participation in the Belgian chemical industry, there is strong central control and interlocking directorates in the industry. The industry is dominated by three large companies: Solvay, Union Chimique Belge, and the SBA-Carbochimique group. Of the eight countries considered in this article, the small companies in Belgium probably have the least to offer in the way of new products and processes: not much significant research is carried on in Belgium outside of the four big companies.

ENGLAND

One of the most striking features of the British chemical industry is the large number of subsidiaries and subsubsidiaries. Approximately 35% of all British companies of any size or significance in the chemical and allied industries are subsidiaries of other companies, either British or foreign. Most are subsidiaries of other British companies, but a number are controlled by well-known foreign corporations. Examples: Monsanto Chemicals Ltd., Reichhold Chemicals, Ltd., Colgate Palmolive Peet, Ltd., Bakelite, Ltd., Armour & Co., Ltd. and Esso Petroleum, Ltd. One cannot invariably distinguish the corporate connection by the name, however. The Associated Ethyl Co., Ltd. has no present corporate or financial connection with the Ethyl Corp., and Permutit Co., Ltd. has no present connection with Permutit in the U.S. There is, however, a very large degree of cooperation between U.S. and British chemical industries. There are probably as many

as 60 important companies in the British chemical and plastics field that are either subsidiaries of U.S. concerns or that have agreements with U.S. manufacturers.

Imperial Chemical Industries, Ltd., accounts for a high percentage of total British chemical production. ICI, with annual sales in excess of \$1.5 billion, has 72 subsidiary and associate companies scattered throughout the world.

The second largest chemical industry member is probably Albright & Wilson, whose annual sales exceed \$100 million. In addition to a number of subsidiaries in the U. K. and throughout the Commonwealth, Albright & Wilson has a number of ties with U. S. companies. For example, it has reciprocal licensing agreements with Metal & Thermit in the U. S. for production of organo-tin compounds. It also has an agreement with Hooker Chemical Corp., covering manufacture and sale of Hetron resins. (In 1956 Albright & Wilson negotiated the exchange of its former subsidiary, Oldbury Electro-Chemical Co. for a substantial stockholding in Hooker Chemical.)

Albright & Wilson is engaged in production of phosphorous chemicals, sulfides and halides, sodium and calcium phosphates, alkyl and aryl phosphates, and phosphonitrilic compounds. In late February, 1960, Albright & Wilson began negotiation for the acquisition of A. Boake Roberts & Co., a diverse company producing a broad range of plasticizers, food chemicals, flavorants, drugs.

The third largest company in the U. K. is Monsanto Chemicals Ltd., controlled by Monsanto Chemical Co.

In the same general sales bracket as Albright & Wilson is Fisons, Ltd. Fisons has annual sales volume approaching \$140-150 million, about 70% of which is concentrated in fertilizers. In fact, it accounts for approximately 40% of total U. K. fertilizer output. It's also engaged in the production of pesticide chemicals, optical bleaches, and is the only U. K. manufacturer of hydrazine.

A progressive middle-size company is Hickson & Welch (Holdings), Ltd. (Castleford, Yorks), which specializes in the manufacture of intermediates for dyestuffs, pharmaceuticals and insecticides. It's making an aggressive research effort in aromatics, is the largest manufacturer of DDT in Great Britain, produces a long list of intermediates.

In addition, Hickson & Welch is the largest manufacturer of optical bleaches in Europe. The main competition in this field comes from Geigy, Ciba, and Bayer. Sandoz and ICI are also manufacturers of optical bleaches.

Coal, of course, has been a cornerstone of the English economy for centuries. It is not surprising, therefore, that the U. K. should have a number of companies making coal tar and coal-tar chemicals. One of the more significant of these companies is Coalite and Chemical Products Ltd., near Chesterfield, Derbyshire, which has pioneered in the production of liquid fuels by hydrogenation and by low-temperature carbonization of coal. It supplies coal-tar to ICI, which produces gasoline by hydrogenation. Coalite and Chemical Products uses by-products of its process to make xylenols and substituted xylenols, 2,4,6-trimethyl phenol, benzyl cresols, chlorinated phenols,

resorcinol and homologues, octyl-catechol, t-butyl catechol, and a long list of other similar coal-tar aromatics. The company uses its own processes for separation of coal tar constituents, and for upgrading them to other materials. It's now piloting processes for Bis-phenol A and for tertiary-butyl phenol.

Also noteworthy is Pure Chemical Ltd. (near Liverpool), a subsidiary of Consolidated Zinc Corp. Ltd., which bought the company in 1958 from H. J. Enthoven Co. Ltd. Pure Chemical produces a variety of organic chemicals including alkyl bromides, bromoacetic esters, betaine hydrochloride, color photography developers, glyceryl-alpha-mono- and dichloro hydrins. Also produced are a number of stabilizers for vinyl chloride polymers. The company produces intermediates such as tertiary-butyl benzene, and tertiary-butyl anthraquinone.

About 50% of the total output of this company is fine organic chemicals. It claims to be the largest producer of organo-tin compounds in Europe with production of the order of 200 tons/year. It also claims to be second in world production of these materials only to Metal & Thermit Corp. The firm sells these products in the United States, as well as in Europe.

MEET THE AUTHORS



Robert S. First

president of Robert S. First, Inc. (New York City), is a chemical engineer with extensive industrial experience. He has held executive positions in market research for Atlas Powder, Celanese Corp. and National Lead. An active member of several technical and marketing societies, he is currently chairman-elect of the Division of Chemical Marketing and Economics of the American Chemical Society.

William D. Gersumky

vice-president of the firm, started out as a research chemist for American Cyanamid, where he was granted several patents. He was also a market analyst for Cyanamid before joining First last year. Like First, he is active in several societies. Also like First, he has become something of an international commuter: the two men can count over 1,100 personal visits to European chemical firms in the past two years.

Please turn page for company list

The 863 Major Chemical Producers

HOLLAND

Acheson Colloiden, N.V., Scheemda (Gr.)
 Algemene Kunstzijde Unie N.V., Arnhem
 Albatross Superfosfatfabrieken N.V., Utrecht
 Aseptafabriek N.V., Delft
 N.V. de Bataafsche Petroleum Maatschappij Carel van Bylandtlaan, 's Gravenhage
 Calve-Delft Oliefabrieken, Delft
 N.V. Cellulose Producten, Deventer
 N.V. Centrale Ammoniakfabriek, Weespervarspel
 N.V. Chefaro Maatschappij (Chemische Fabriek Rotterdam), Rotterdam
 Chlorodont Company N.V. Paul Van Vlietstraat, hoek Daniel Goedkoopstraat, Amsterdam
 Coating-Chemie Adviesbureau voor Chemische Techniek Chemische Fabriek, Soestdijk
 Colgate-Palmolive Handel Mij N.V., Amsterdam
 N.V. Lijm en Gelatinefabriek "Delft," Delft
 Wilm's Floet's Tabakmaatschappij N.V. AFD "Denico," Wormer
 Lak-Verf-en Celluloselakfabriek B. Deuzemann, Zwolle
 Nederlandsche Dow Maatschappij N.V., Rotterdam
 Koninklijke Industriele Maatschappij, V/H Noury & Van der Lande AFD E.C.I., Deventer
 N.V. Electro Zuur-en Waterstoffabriek, Amsterdam
 E.N.C.K. Eerste Nederlandsche Coöperatieve Kunstmestfabriek, Vlaardingen
 N.V.C. Van Epenhoven's Chemische Fabrieken, Zuidwolde
 N.V. "Era" Fabriek, Mij. Voor Chemische Industrie, Amersfoort
 N.V. Maatschappij voor Vasverwerking Erdalfabriek, Amersfoort
 Esso Nederland N.V. "Esso Gebouw," 's Gravenhage
 "Falt Oil" N.V., Delden
 Feenstra's Verf & Lakfabriek N.V., Groningen
 N.V. Franken Donders United Aniline Works, Tilburg
 Frencken's Fabrieken, Weert
 Chemische Fabriek Gembo N.V., Winschoten
 N.V. Koninklijke Stearine Kaarsenfabrieken "Gouda-Apollo," Gouda
 Usines Guimet, Westkade, Sas van Gent
 N.V. Chemische Fabriek v/H Dr. A. Haagen, Roermond
 N.V. Chemische Industrie van Hasselt, Amersfoort
 N.V. Hollandsche Kunstzijde Industrie (H.K.I.), Breda
 N.V. Hollandsche Melksuikerfabriek, Uitgeest
 N.V. Hollandsche Metallurgische Bedrijven, Westervoortsedijk, Arnhem
 N.V. Chemische Industrie en Handel mij, Wed. Hendorff Block & Braet, Schoonhoven
 Koninklijke Nederlandsche Hoogovens & Staalfabrieken N.V., Tuinderslaan, IJmuiden
 N.V. Chemische Verstoffenfabriek V.H. L.Th. Ten Horn, Maastricht
 Zeepfabriek Hustinx N.V., Maastricht
 N.V. Insecto, Boxtel

N.V. Societet voor Chemische Industrie "Katwijk," Katwijk aan Zee
 Koninklijke Zwavezuurfabriek v/H Ketjen N.V., Amsterdam
 N.V. Koninklijke Nederlandsche Zoutindustrie K.N.Z., Hengelo
 Koninklijke Nederlandsche Gist-en-Spiritusfabriek N.V., Delft
 Koninklijke Nederlandsche Springstoffenfabrieken, N.V., Amsterdam
 Kortman & Schulte N.V., Rotterdam
 Chemische Fabriek Laber & Co., Enschede
 Lever's Zeep-Maatschappij N.V., Rotterdam
 N.V. Maatschappij Tot Exploitatie van Kooksoven-gassen (Mekog), IJmuiden
 O. J. Meijer's Dextrinefabrieken N.V., Veendam
 Koninklijke Lak-Vernis-en Verffabriek Molyne & Co., N.V., Rotterdam
 N.V. Chemische Fabriek "Naarden," Naarden
 Nationale Zetmeelindustrie N.V., Veedam
 N.V. Nederlandsche Asphaltfabriek, Alphen aan den Rijn
 Nederlandsche Fotografische Industrie N.V. de Beaufortlaan, Soest
 N.V. Nederlandsche Patent-en Kristal Soda-fabriek Voorheen Dury and Hammes, Rotterdam
 Nederlandsche Raffinaderij van Petroleumproducten, Haarlem
 Eerst Nederlandsche Nicotine-Extractfabriek, Oul Gastel
 Noury & Van der Lande's Exploitatie Mij. N.V., Deventer
 Kunstzijde-spinnewijf NYMA N.V., Nijmegen
 Nederlandsche Persil Maatschappij N.V., Amsterdam
 N.V. Philips-Roxane, Pharmaceutische-Chemische 'Duperar' P.C., Amsterdam
 N.V. Polak & Schwarz's Essencefabrieken, Zaandam
 Regout-Matthey N.V., Maastricht
 "SABA" Fabriek van Chemische Producten, Dinxperlo
 Scado-Archer-Daniels N.V., Zwolle
 N.V. Chemische Fabriek "Schiedam," Schiedam
 Pieter Schoen & Zoon N.V., Zaandam
 W. A. Scholten's Chemische Fabrieken N.V., Foxhol (Gr.)
 N.V. Chemische Fabriek Servo, Amt. Delden
 N.V. Nieuwe Nederlandsche Mij. Tot Vervaardigen Van Spiegeglas, Glazien Voorwerpen en Chemische Producten, Adfeling Chemische Producten, Sas van Gent
 Staatsmijnen in Limburg, Heerlen
 Exploitatie Maatschappij Stork-Chemie N.V., Hengelo
 N.V. Chemische Industrie Synres, Hoek van Holland
 Kunstharsfabriek "Synthese" N.V., Katwijk aan Zee
 Teerunie N.V., Uithoorn
 Chemische Fabriek C.A. Verbunt N.V., Dongen (n. Br.)
 Vernis-en Verffabriek V.H.H. Vettewinkel & Zonen N.V., Amsterdam

N.V. Fabriek van Chemische Producten Vondelingenplaats, Vlaardingen
 F.A. J. J. Wigleven, Rotterdam
 N.V. Zuid-Nederlandsche Spiritusfabriek, Bergen op Zoom

SWEDEN

Aga-Faxius, A.B., Malmö
 Forenade, A.B., Helsingborg
 Reymersholms Gamla Industri A.B., Helsingborg
 Weibull, Garvamnes A.B., Landskrona
 Svenska Attikafabriket A.B., Perstorps
 Svenska Tandsticks A.B., Jonkoping
 Elektrokemiska A.B., Bohus
 Agren A.B., Göteborg
 Svenska Tandsticks A.B., Göteborg
 Kemifa A.B., Partille
 Svenskt Konstnärlig A.B., Boras
 Billingsfors—Langed A.B., Billingsfors
 Munkedals A.B., Munkedal
 Vargons A.B., Vargon
 Boxholms A.B., Boxholm
 Aktiebolaget Karlshamns Oljefabriket, Norrköping
 Oxelösunds Järnverks A.B., Oxelösund
 Svenska A.B. Gasacumulator Lidingo, Värtan
 Casco A.B. Nacka, Stockholm 11
 Gaddvikens Superfosfatfabriket A.B., Nacka, Stockholm 4
 Barnängens Tekniska Fabrikeret A.B., Stockholm 12
 Wilhelm Becker, A.B., Stockholm 1
 Boldens Gruv A.B., Stockholm C
 Ferrolegeringar A.B., Stockholm 16
 Liljeholmens Stearinfabriket A.B., Stockholm 11
 Stockholms Benmjölsfabriket A.B., Stockholm 12
 Stockholms Superfosfatfabriket A.B., Stockholm 5
 Moinbacka—Träsil A.B., Forshaga
 Billeruds A.B., Säffle
 Uddeholms A.B., Uddeholm
 Svenska Rayon A.B., Valberg, Alvenas
 Degerfors Järnverks A.B., Degerfors
 Nitroglycerin A.B., Gyttorp
 Bofors A.B., Karlskoga, Bofors
 Svenska Skifferolje A.B., Örebro
 Svenska Salpeterverken, A.B., Kopings
 Alby NYA Kloratfabriket A.B., Mansbo
 Stora Kopparbergs Berslag A.B., Falun
 Korsnäg A.B., Gävle 2
 Iggesunds Bruk A.B., Iggesund

Mackmyra Sulfit A.B.,
Mackmyra
Stroms Bruks A.B.,
Stromsbruk, Harmanger
Bergvik och Ala A.B.,
Soderhamn
Marna-Langors A.B.,
Soderhamn
Forss A.B.,
Kopmanholmen och Ornskoldsvik
Svenska Cellulosa A.B. (SCA),
Sundsvall
Dynes A.B.,
Vaja, Dynas
Mo Och Domso A.B.
Ornskoldsvik,
Alfredshem

SWITZERLAND

Berner Elektrochemische Werke A.G.,
Bern
Carbo Aktiengesellschaft,
Bern-Liebefeld
Cellulosefabrik Attisholz, A.G.,
Vormals Dr. B. Sieber,
Attisholz bei Solothurn (Post Luterbach)
Chemische Fabrik Schweizerhall A.G.,
Basel
Ciba A.G.,
Basel
Durand & Hugenin A.G.,
Basel
Elektrochemische Fabrik Francke A.G.,
Aarau
Esroko A.G.,
Dubendorf (Zurich)
J. R. Geigy A.G.,
Basel
Ed. Geistelich Sohne A.G. fur Chem. Industrie,
Schlieren (Zurich)
L. Givaudan & Cie. S.A.,
Vernier (Geneve)
Henkels Persilwerke, Aktiengesellschaft,
Pratteln (Baselland)
Holzverzuckerungs A.G.,
Ems (Graubunden) Zurich
A.G. R. & E. Huber,
Pfaffikon (Zurich)
Lonza Elektrizitätswerke u. Chemische Fabriken
A.G. Gampl (Wallis),
Basel
Oel- & Chemie-Werk A.G.,
Hausen bei Brugg (Aargau)
Sandoz A.G.,
Basel
Saurefabrik Schweizerhall,
Schweizerhalle (Baselland)
Schweizerische Sodaefabrik,
Zurzach (Aargau)
Schweizerische Teerindustrie A.G.,
Pratteln (Baselland)
Seifenfabrik Sunlight,
Olten (Solothurn)
Suhner & Co. A.G.,
Herisau (App. A. Rh.)
Vereinigte Farbereien & Appretur A.G.,
Thalwil Zurich
Chemische Fabrik Uetikon,
Uetikon a. See (Zurich)

FRANCE

Societe Meridionale de Produits Chimiques Agro-
colles "Agricola,"
Marseille
L'Air Liquide (S.A. pour l'Etude et l'Exploitation
des Procedes Georges Claude),
Paris
Societe Algerienne de Produits Chimiques et d'En-
grais Alger,
Paris
S. A. Altitor,
(Address not known)
L'Ammoniaque de l'Lievin,
Paris
Societe des Raffineries Francaises de Petroles de
l'Atlantique, (Antar),
Paris
Societe de Produits Chimiques et Engrais d'Auby,
Paris

Fabriques de Produits Chimiques Billault, S.A.,
Paris
Societe le Borax Francais,
Paris
Compagnie Bordelaise de Produits Chimiques,
Bordeaux
Societe le Carbene Lorraine,
Paris
Carbonisation et Charbons Actifs (C.E.C.A.),
Paris
Societe des Colles et Gelatines Francaises,
Paris
Societe des Couleurs Zinciques S.A.,
Aubervilliers (Seine)
Societe de Produits Chimiques Courrieres-Kuhl-
mann,
Paris
Societe Industrielle des Derives de l'Acetylene
(S.I.D.A.),
Paris
Societe les Derives Ethyliques,
Paris
Etablissements P. Dumont S.A.R.L.,
Paris
Societe des Elastomeres de Synthese,
Present address not known
Union Francais d'Engrais et de Produits Chimiques
S.A.,
Paris
Societe Anonyme Francaise Eso-Standard,
Paris
Societe Industrielle d'Ethanol de Synthese,
Address not known
Societe des Produits Chimiques Ethyl-Kuhlmann,
Paris
Ethy-Synthese Societe Ethylene-Plastique,
Douai (Nord)
Societe d'Explosifs et de Produits Chimiques,
Paris
Societe Industrielle et Financiere de Lens (Fin-
lens),
Lille
France Citrique,
Marseilles
Societe Miniere et Industrielle Franco-Bresilienne,
Paris
Societe Chimique de Gerland,
Lyon (Rhone)
Gifrer et Berbezat S.A.,
Dourbes (Isere), near Villeurbanne (Rhone)
Societe Francaise des Glycerines S.A.,
Paris
Societe Chimique de la Grande-Paroisse,
Paris
Huiles Goudrons et Derives (H.G.D.),
Paris
Houilleres du Bassin de Lorraine (H.B.L.),
Merlebach (Moselle)
Houilleres du Bassin du Nord et du Pas-de-Calais,
Douai (Nord)
S.A. Pour l'Industrie Chimique,
Mulhouse-Dornach (Ht.—Rhin).
Societe des Etablissements Keller et Leleux,
Paris
Manufacture de Produits Chimiques du Nord, S.A.,
Etablissements Kuhlmann,
Paris
Societe Commerciale Lambert-Riviere,
Paris
Etablissements Lambiotte Freres, S.A.,
Paris
Societe des Etablissements P. Linet,
Paris
Societe Lorraine-Kuhlmann,
Paris
Mante et Cie.,
Marseilles
Manufacture Normande de Polyethylene,
Address not known
Societe des Produits Chimiques Marles-Kuhlmann,
Paris
Societe Marseillaise du Sulfure de Carbone,
Marseilles
Les Usines de Melle S.A.,
Saint Leger-les-Melle (Deux-Sevres)
Naphthachimie,
Paris
Nobel-Bozel (Formerly Bozel-Maletra),
Paris
Societe Normande de Produits Chimiques,
Paris
Societe Novacel (Nouvelles Applications Chimiques
et Cellulosiques),
Paris
Office National Industriel de l'Azote (O.N.I.A.),
Paris
Organico S.A.,
Paris
Societe Francaise d'Organo Synthese,
159 avenue du Roule,
Neuilly-sur-Seine (Seine)
Societe "l'Oxyhydrique Francais," Malakoff
Societe Francaise des Petroles, B.P.,
Paris
Societe Nationale des Petroles d'Aquitaine,
Paris
Petrosynthese,
Address not known
Societe Generale des Engrais et Produits
Chimiques Pierrefitte, (formerly Societe des
Phosphates Tunisiens)
Paris
Cie. des Produits Chimiques et Electrometallur-
giques Pechiney,
Paris
Pechiney-Progil,
Paris
Societe Potasse et Engrais Chimiques,
Paris
Societe Potasse et Produits Chimiques,
Thann (Haut-Rhin)
Societe des Produits Azotes,
Paris
Fabriques de Produits Chimiques de Thann et de
Mulhouse,
Thann (Haut-Rhin)
Societe de Produits Chimiques et de Synthese,
Bezons (Seine et Oise)
Societe des Produits Chimiques et Matieres
Colorantes de Mulhouse,
Paris
Compagnie Francaise de Produits Oxygenes S.A.,
Paris
Progil S.A.,
Paris
Prosimacfi,
Vitry-sur-Seine,
(Seine)
Societe Reichhold—Beckacite,
Bezons (Seine et Oise)
Societe des Usines Chimiques Rhone-Poulenc,
Paris
Produits Chimiques de Ribecourt,
Paris
Compagnie Centrale Rousselot, S.A.,
Paris
Societe Resines et Vernis Artificiels (R.V.A.),
Paris
S.A. des Matieres Colorantes et Produits Chimiques
de Saint-Denis,
Paris
Manufactures de Glaces et Produits Chimiques de
Saint-Gobain,
Chauny et Cirey,
Paris
Societe d'Applications Chimiques,
Paris
S.E.R.S. (Societe d'Etudes et Recherches Scien-
tifiques),
Paris
Shell-Saint-Gobain,
Paris
Etablissement Siline,
Paris
Solvay et Cie.,
Paris
Societe Solvic,
Paris
S.O.R.C.H.A.P.,
(Societe de Recherches Chimiques et d'Applica-
tions Industrielles),
Paris
Societe de Produits Chimiques des Terres Rares,
Paris
Usines Chimiques des Laboratoires Francais
(U.C.L.A.F.),
Paris
Societe Ugilor,
Paris
Societe d'Electrochimie, d'Electrometallurgie et
des Acleries Electriques d'Ugine,
Paris

863 COMPANIES

ITALY

A.C.N.A. Aziende Colori Naz. Affini, S.p.A., Milano
 A.I.C. Approvvigionamenti Industriali Chimici, Torino
 Alcamir S.p.A., Milano
 Aminochemia S.r.l., Milano
 Amonn I.F. S.p.A., Bolzano
 "Anic" S.p.A., Direz, Milano
 A.P.E. Applicazione Processi Electrochimici S.A., Genova
 "Arnella" Soc. Italiana per l'Industria Dell' Acido Citrico et Affini, Palermo
 Azienda Minerali Metallici Italiani "A.M.M.I.", Roma
 Aziende Chimiche Vittorio Barbini S.p.A., Venezia
 Aziende Chimiche Riunite Angelini Francesco A.C.R.A.F., Roma
 Bario & Derivati S.p.A., Milano
 A. E. & C. Bianchi, Societa Chimica Lombarda (Soc. Paz.), Milano
 Bombrini Parodi—Delfino S.p.A., Roma
 Ing. Giulio Bonelli, Industrie Chimiche I.C.I.B., Milano
 Cartiera di Tolmezzo S.p.A., Tolmezzo
 C.E.D.A. Industria Chimica S.p.A., Bolzano
 Centro Chimico Subalpino Dr. A. Maniaci, Torino
 Centro Ricerche Metallurgiche S.p.A., Torino
 "Cesalpinia" S.p.A., Milano
 CIBA—Industria Chimica S.p.A., Milano
 C.I.P. Compagnia Italiana Petrolio, Roma
 "Cledca" Conservazione Legno e Distillerie Catrame S.p.A., Milano
 Colorificio Italiano Max Meyer S.p.A., Milano
 "Ing. Luigi Conti-Vecchi" S.p.A., Roma
 Giacomo fu Andrea Costa, Genova
 Distillerie Italiane S.A., Milano
 Elettrocoburium S.p.A., Milano
 Elettrografite di Forno Allione S.p.A., Milano
 Carlo Erba S.p.A., Milano
 "Eridania" Zuccherifici Nazionali S.p.A., Genova
 Esperis S.A., Milano
 Etruria (S.p.A.) Prodotti Chimici per l'Agricoltura, Firenze
 Fabbrica Derivati del Piombo S.p.A., Milano
 Fabbrica Interconziale Marchigiana di Concimi e Prodotti Chimici (Soc. An.), Marerata
 Fabbrica Nazionale Estratti Tannici "F.N.E.T." Torino
 Fabbrica Sali di Barlo, Concimi ed Altri Prodotti Chimici S.p.A., Milano
 Fabbriche Riunite Amido Glucosio Destrina S.p.A., Milano
 Farmaceutici Italia S.A. (Farmitalia), Milano
 F.I.C.I.S. Fabbrica Italiana di Colori ed Inchiostri da Stampa S.p.A., Milano

F.R.O.—Fabbriche Riunite Ossigeno S.p.A., Verona
 Italital S.p.A., Milano
 F. Lli Galtarossa S.p.A., Milano
 "Gaslini" S.A., Genova
 Mario Geronazza S.p.A. Industrie Chimiche, Milano
 Idroellettrica di Borgofranco S.p.A., Torino
 I.M.A.D. Industrie Meridionali Azoto e Derivati S.A., Napoli
 Industrie Chimiche Barzagli UFA S.p.A., Milano
 Instituto de Angeli S.p.A., Milano
 I.S.V.E.C.A.—A. Masciadi S.p.A.—Industria Smalti Vernici e Colori Affini Viale Premuda, Milano
 Larderello S.p.A. per lo Sfruttamento delle Forze Endogene, Roma
 Lavorazioni Chimiche E. Imballaggi Metallici S.A., Milano
 Ledoga S.p.A., Milano
 Mazzucchelli Celluloide S.p.A., Varese
 Metalli Preziosi S.p.A.—Aziende Riunite; General die Metalli Preziosi e Cesare Fraecari & C. Milano
 Mira Lanza S.p.A., Genova
 Montecatini—Soc. Generale per l'Industria Mineraria e Chimica S.p.A., Milano
 O.L.C.A. Oleifici Calabresi, Gioia Tauro (Reggio Calabria)
 Palmolive S.p.A., Milano
 Polymer Industrie Chimiche S.p.A., Milano
 Rumianca S.p.A., Torino
 "Saffa" Fabbriche Fiammiferi ed Affini S.A., Milano
 Sandoz S.p.A., Milano
 Saponeria V. Lo Faro & C. S.p.A., Genova
 S.A.R.I.A.F. Societa Romagnola Industrie Agricolo Farmaceutiche, Bologna
 SIAD—Soc. Ital. Acetilene e Derivati, Bergamo
 S.I.A.P.A.—Societa Ital-Americana Prodotti Antiparassitari S.A., Roma
 Sicedison S.p.A., Milano
 "Sil" Soci Ital. del Litopone, Milano
 "Sio" Societa per l'Industria dell'Ossigeno e di Altri Gas, Milano
 SIPCAM—Soc. Ital. Prodotti Chimici e per l'Agricoltura S.p.A., Milano
 Sirio S.A. Saponi Profumerie et Glycerine, Milano-Bovisa
 Soc. Chimica dell'Aniene S.A., Milano
 Soc. Edison—Settore Chimico—Azienda Industriale "San Marco," Venezia
 Soc. Edison—Settore Chimico S.p.A., Milano
 Soc. Electricca ed Elettrochemica del Caffaro, Milano
 Soc. Ital. Esplosivo Cheddite S.p.A., Torino
 Soc. Ital. Prodotti Esplosivi, Milano
 Soc. Ital. Serie Acetica Sintetica S.I.S.A.S. S.p.A., Milano
 Soc. Ligure per l'Industria Dell'Acido Tannico S.p.A., Genova
 Soc. Rhodiatoce Milano
 Soc. Toscana Azoto "S.T.A." S.p.A. Firenze
 Soc. Solvay & C., Milano

"Solplant" Prodotti per l'Agricoltura, Milano
 Solvic—Industria delle Materie Plastiche S.p.A., Milano
 "Spero" S.A., Genova
 "Terni" Societa per l'Industria e l'ellettricità, Roma
 "Vetrocoker" S.p.A., Torino

WEST GERMANY

Agep Gnacke & Co. Chemische Fabrik, Horrem (Bz. Köln)
 Aktiengesellschaft des Altenbergs fur Bergbau und Zinkhuttenbetrieb, Essen-Bergeborbeck
 AG fur Chemische & Teerprodukte, Hamburg 36
 AG fur Chemische Industrie Gelsenkirchensalke, Gelsenkirchen-Schalke
 AG fur Zink-Industrie, vorm. Wilhelm Grillo 1., Duisburg-Hamborn
 Otto Aldag, Hamburg 13
 August Wilhelm Andernach K.G., Beuel
 Anorgana GmbH, München 33
 Aschaffenburger Zellstoffwerke AG., Redenfelder (Oberbay)
 Auer-Gesellschaft AG., Berlin N. 65
 Badische Anilin & Soda-Fabrik AG., Ludwigshafen (Rhein)
 Van Baerle & Co. Chemische Fabrik, Gernsheim (Rhein)
 Bakelite Sauerstoff-Industrie K.G., Letmathe (Sauerland)
 Bayerischer Berg-, Hutten- und Salzwerke AG., München 34
 Dr. Beck & Co. GmbH, Spezialfabrik fur Isolierlacke und Kunstarze fur die Electrotechnik, Hamburg
 Carl Becker, Hamburg-Billstedt
 P. Beiersdorf & Co., AG., Hamburg 20
 Joh. A. Benckiser GmbH., Ludwigshafen (Rhein)
 Bergbau AG. Ewald-König Ludwig Herten (Westf.)
 Berkwerksgesellschaft Hibernia AG., Herne
 "Berzelius" Metallhütten GmbH., Duisburg-Wanheim
 W. Bleisterfeld & Co., Hamburg 1
 C. H. Boehringer Sohn Chemische Fabrik O.H.G., Ingelheim (Rhein)
 Bohler Lackfabrik Georg Schöffler K.G., Böhl (Pfalz)
 Gebr. Borchers AG., Goslar
 Brennerei und Chemische Werke Tornesch GmbH., Tornesch (Holst)
 Burbach-Kaliwerke, Kassel
 Carl Canzler, Apparate und Machinebau, Duren
 Wilhelm Carstens, Fabrik fur Elektro Isoliermaterial Lackfabrik, Hamburg-Wilhelmsburg
 Cassella Farbwerke Mainkur AG., Frankfurt/Main
 Chemieprodukte K.G., Berlin-Brütz
 Chemiewerk Dr. Paul Stock GmbH., Starnberg
 Chemische Fabrik Billwarder AG., Hamburg-Billstedt
 Chemische Fabrik Budenheim AG., Budenheim
 Chemische Fabrik Curtius GmbH., Duisberg
 Chemische Fabrik Dr. Hugo Stoltzenberg, Hamburg-Eidelstedt
 Chemische Fabrik Dr. Reininghaus, Mülheim (Ruhr)
 Chemische Fabrik Freising, vormals Hemke & Co. K.G., Freising

Chemische Fabrik Griesheim, Frankfurt/Main
 Chemische Fabrik Hoesch K.G., Duren
 Chemische Fabrik Holten GmbH., Oberhausen-Holten
 Chemische Fabrik Kalk GmbH., Köln-Kalk
 Chemische Fabrik Lehrte Dr. Andreas Kossel GmbH., Lehrte (Hann.)
 Chemische Fabrik Stock Lausen & Cie., Krefeld
 Chemische Fabrik von Heyden AG., München 23
 Chemische Fabrik Wesseling AG., Wesseling Bez. Köln
 Chemische Fabrik Weyl AG., Mannheim-Waldhof
 Chemische Fabrik Wulfel, Just und Dittmar, Hannover-Wulfel
 Chemische Fabriken Oker & Braunschweig AG., Oker (Harz)
 Chemische Industrie Erlangen GmbH., Erlangen
 Chemische Werke Albert, Wiesbaden-Biebrich
 Chemische Werke Bergkamen AG., Berkamen über Kamen (Westf.)
 Chemische Werke Huls GmbH., Marl, Kr. Recklinghausen (Westf.)
 Chemische Werke Rombach GmbH., Oberhausen (Rheinland)
 Chemische Werke Worms-Weinsheim GmbH., Worms-Weinsheim
 Chemulack, Chemische U. Lackfabrik GmbH., Berlin-Wilmersdorf
 CIBA AG., Wehr (Baden)
 Dekalin Deutsche Klebstoffwerke Rodiger & Sohn GmbH., Hanau
 Delta-Werke GmbH., Worms
 Deutsche Advance Produktion GmbH., Marienberg über Bensheim
 Deutsche Bergin AG., Mannheim-Rheinau
 Deutsche Fettsaure-Werke GmbH., Witten (Ruhr)
 Deutsche Gelatine-Fabriken, Goppingen (Württ.)
 Deutsche Gesellschaft für Schadlingsbekämpfung Frankfurt/Main
 Deutsche Gold und Silver-Scheideanstalt, vorm. Roessler "Degussa," Frankfurt/Main
 Deutsche Shell AG., Hamburg 36
 Deutsche Solvay-Werke, Solingen-Onlidge
 Ernst Diegel K.G., Lackfabrik, Alsfeld (Oberhess.)
 Diwag Chemische Fabriken AG., Berlin-Waidmannslust
 Dragoco Gerberding & Co. Spezialfabrik konzentrierter Riech- und Aromastoff Holzminden
 Duisburger Kupferhütte, Duisburg
 Dynamit-Aktien-Gesellschaft vormals Alfred Nobel & Co., Troisdorf
 Elektrochemische Werke München AG., München
 Elektro-Nitrum AG., Laufenburg (Baden)
 Max Ermes, Fabrikation Chem. u. Techn. Produkte F.D. Spiegelindustrie, Langelsheim
 Esso AG., Hamburg 36
 Carl Ewald Chemische Werke K.G., Sobernheim (Rheinland)
 Ewald Dorken AG., Herdecke (Ruhr)
 Fabrikationsgesellschaft Dr. Carl Hahn M.B.H., Düsseldorf
 Fahlberg-List GmbH., Wolfenbüttel
 Farbenfabriken Bayer AG., Leverkusen
 Farbenfabrik Hansa GmbH., Kiel

Farben-Jentsch G.H.G., Frankfurt/Main
 Farbenkrauth O.H.G. Lackfabrik, Darmstadt
 Farbwerke Franz Rasquin GmbH., Köln-Mülheim (22c)
 Farbwerke Hoechst AG., vormals Meister, Lucius & Bruning Frankfurt/Main
 Feldmühle Papier & Zellstoff AG., Düsseldorf-Oberkassel
 Filmfabrik AGFA Wolfen AG., Wolfen Kr. Bitterfeld
 Emil Frei K.G., Donningen (Schwarzw.)
 Geholt Werke Gebrüder Holtz Lackfabrik GmbH., Graben (Kr. Karlsruhe)
 J.R Geigy AG., Grenzach (Baden)
 Joh. Pfeffer, Gelatine und Leimwerke, Memmingen (Bavaria)
 Gelsenberg Benzin AG., Gelsenkirchen-Horst
 Gerling Holt & Co., Hamburg-Altona
 Gesellschaft für Linde's Eimaschinen AG., Holzriegelskreuth bei München
 Gewerkschaft Keramchemie, Siershahn (Westf.)
 Gewerkschaft Victor Chemische Werke, Castrop-Rauxel 2
 Gebrüder Giulini GmbH., Ludwigshafen-Rhein
 Glasurit-Werke M. Winkelmann AG., Hamburg 1
 Th. Goldschmidt AG., Essen
 Guano-Werke AG., Hamburg 1
 Hamburger Zincweiss-Fabrik Fr. Lohss & Co., Hamburg-Billstedt 1
 Hammonia-Stearin-Fabrik, Offenbach/Main
 Hans-Heinrich-Hutter GmbH., Frankfurt/Main
 Harburger Chemische Werke Schon & Co. AG., Frankfurt/Main
 Harzer Achsenwerke K.G. Schwemann & Althoff, Bornum (Harz) über Hildesheim
 Henkel & Cie. GmbH., Düsseldorf-Holthausen
 W. C. Heraeus GmbH., Hanau
 Holzverzuckerungs GmbH., Holzminden
 Friedrich Hummel Hautleimfabrik, Vaihingen (Eng.) (Württ.)
 Hüttenwerk Salzgitter AG., Salzgitter-Drütte 1
 Imhausen-Werke GmbH., Witten (Ruhr)
 Industriegas GmbH. & Co. K.G., Köln-Braunsfeld
 Internationale Galalith-Ges. AG., Hamburg-Harburg
 Isar-Chemie GmbH., München 9
 Kali-Chemie AG., Hannover
 Ernst Kalkhoff Chemische Fabrik, Mainz
 Kalle & Co. AG., Wiesbaden-Biebrich
 Kelmidia GmbH., Augsburg
 Stephan Ketels GmbH., Bremen-11
 Kiefa GmbH. Chemische Fabrik, Frankfurt-Süd
 Knapsack-Griesheim AG., Knapsack, bei Köln
 August Koenig, Farben Lacke & Anstrichbedarf, Berlin-W 35
 Knoll A.G. Chemische Fabriken, Ludwigshafen (Rhein)
 Königswarter & Ebelli Chemische Fabrik GmbH., Hagen (Westf.)
 Krupp Kohlechemie GmbH., Wanne-Eickel
 Kunststoffgesellschaft M.B.H., Hamburg 36

Langbein-Pfanhauser Werke AG., Neuss/Rhein
 Lech-Chemie AG., Gersthofen bei Augsburg
 Chr. Lechler & Sohn, Nachf., K.G. Lack- und Lackfabrik, Stuttgart-Feuerbach
 Paul Lechler GmbH., Gelsenkirchen-Buer
 Lehmann & Voss & Co., Hamburg 36
 Lindgens & Sohne, Chemische Fabriken Köln-Mülheim
 Köln-Mülheim
 Karl Löffler K.G., Köln-Braunsfeld
 Dr. Paul Lohmann, Chemische Fabrik, Emmerthal
 Gustav Lorse AG., Berlin-Charlottenburg 1
 Lanza-Werke, Elektrochemische Fabriken GmbH., Weil (Rhein)
 Lucca A.G., Heilbronn (Neckar)
 Luitpoldhütte Bergbau und Hüttenbetriebe Amberg (13a) (Opf.)
 Lüneburger Wachsbleiche J. Borstling AG., Lüneburg
 Lurgi Gesellschaft für Chemotechnik M.B.H., Frankfurt/Main
 Mainzer Lackfabrik Becker & Baurle K.G. Mainz-Mombach
 Dr. L. C. Marquart AG., Chemische Fabrik, Beuel (Rhein)
 E. Matthes & Weber GmbH., Düsseldorf
 Mehnert & Veeck K.G. Lackfabrik, Nürnberg-W 20
 E. Merck AG., Darmstadt
 Metallgesellschaft AG., Frankfurt/Main
 Metallwerke Unterweser AG., Nordenham 2
 A. Motard & Co. Zweigniederlassung der Schedemann-Motard-Werke AG., Berlin-Spandau
 Naphtol-Chemie, Offenbach (Main)
 Oscar Neynaber & Co. AG., Loxstedt (Bz. Bremen)
 Norddeutsch Affinerie, Hamburg 36
 Norddeutsche Ceresin-Industrie Dr. Strommengen und Co. GmbH., Hamburg 1
 Norddeutsche Chemische Fabrik in Harburg, Hamburg-Harburg 1
 Norddeutsche Chemische Werke GmbH., Hannover
 Norddeutsche Glycerin und Fettsaurewerke Friedrich Thorl, Hamburg-Bergerdorf
 Nordische Oelwerke Walther Caroux, Hamburg-Wilhelmsburg
 Nord-West Deutsche Hefe und Spritwerke AG., Hameln (Wester)
 Oelwerke Noury & Van der Lande GmbH., Emmerich
 Otabl-Minen & Eisenbahn Gesellschaft, Frankfurt/Main
 Dr. Otto Saurebau & Keramikwerke, Bendorf (Rhein)
 Oxydo Gesellschaft für Chemische Produkte M.B.H., Emmerich-Rhein
 Palmolive Binder & Ketels GmbH., Hamburg-Billbrook
 Perga-Chemie GmbH., Karlsruhe-West
 Otto Perutz Trockenplattenfabrik, GmbH., München
 Pfeilring-Werke AG., Berlin-Charlottenburg 2
 Phenolchemie GmbH., Gladbeck (Westf.)
 Dr. F. Raschig GmbH., Chemische Fabrik Ludwigshafen (Rhein)
 Reichhold Chemie AG., Hamburg-Wandsbek

863 COMPANIES

Rei-Werke GmbH.,
 Boppard
 Rhein-Chemie GmbH.,
 Heidelberg
 Rheinische Olefwerke GmbH.,
 Wesseling (Bz. Köln)
 Rheinpreussen GmbH.,
 Homberg (Ndr.)
 Riedel-de Haen AG.,
 Seelze bei Hannover
 Roehlingsche Eisen und Stahlwerke GmbH.,
 Ludwigshafen (Rhein)
 Rohm & Haas GmbH.,
 Darmstadt
 Ruhrchemie AG.,
 Oberhausen-Holten (Rhld.)
 Rutgerswerke AG.,
 Frankfurt/Main
 Ruhrgas AG.,
 Essen
 Ruhrkunststoff GmbH.,
 Mülheim (Ruhr)
 "Sachtleben" A.G. für Bergbau und Chemische Industrie
 Homberg (Ndr.)
 Saline Ludwigshalle AG.,
 Saline & Chemische Fabrik
 Bad Wimpfen-Neckar
 Salzdetfurth AG.,
 Hannover
 Sanapol-Werk GmbH.,
 Quakenbrück
 Sandoz-Produkte GmbH.,
 Lorrach (Baden)
 Saureschutz Rheinruhr GmbH.,
 Gladbeck (Westf.)
 F. Schacht K.G.,
 Braunschweig
 Scheidemandel-Motard-Werke AG.,
 Berlin-Spannade
 Schering AG.,
 Berlin N. 65
 Schill und Sellacher Chemische Fabrik,
 Stuttgart
 Carl Schlenk AG.,
 Nürnberg-N.
 Schleswig-Holsteinische Farben-Fabriken, M. Wilckens Sohn,
 Schleswig-Holstein
 Scholven Chemie, Gelsenkirchen-Bauer,
 Gelsenkirchen-Bauer
 Schramm Lack- und Farbenfabriken AG.,
 Offenbach (Main)
 Dr. Theodor Schuchardt GmbH.,
 München
 Sichel-Werke, AG.,
 Hannover-Limmer
 G. Siegle & Co. GmbH., Farbenfabriken,
 Stuttgart
 Siegwerke-Farbenfabrik Keller, Dr. Rung & Co.,
 Siegburg
 F. B. Silbermann, Chemische Fabriken,
 Augsburg
 C. F. Spies & Sohn, Chemische Fabrik,
 Kleinkarbach (Rheinfalz)
 Hermann C. Starck,
 Berlin-Lichterfelde
 C. Stark Inh. Dr. K. Herdina, Chemische & Tintenfabrik,
 München
 Stibiox-Werk GmbH.,
 Braunschweig-Glimmrode
 Komm. Ges. Wilhelm Stodiek & Co.,
 Bielefeld
 Stolberger Zink A.G. für Bergbau und Hüttenbetrieb,
 Aachen
 Emil Struve & Co.,
 Hamburg-Eidelstedt
 Sud-Chemie AG.,
 München 3
 Suddeutsche Chemische Werke GmbH.,
 Gernsheim (Rhein)
 Suddeutsche Kalkstickstoff-Werke AG.,
 Trostberg (Obb)
 Südwestdeutsches Kunstharsz-Werk, Dr. Eibel
 GmbH.,
 Frankfurt-Ost
 F. Thorl's Vereinigte Harburger Oelfabriken AG.,
 Hamburg-Harburg

Tivoli Werke AG.,
 Hamburg-Eidelstedt
 Union Rheinische Braunkohlen Kraftstoff AG.,
 Köln
 Unterharzer Berg- u. Hüttenwerke GmbH.,
 Goslar
 Verein Deutscher Oelfabriken,
 Mannheim
 Vedag Vereinigte Dachpappen-Fabriken AG.,
 Frankfurt
 Vereinigte Kaliwerke Salzdetfurth AG.,
 Hannover
 Vereinigte Stearinwerke GmbH.,
 Hamburg
 Vereinigte Ultramarinfabriken AG., vorm. Leverkusen
 Zettnau & Consorten,
 Köln
 Vertriebsgemeinschaft für Harzer Zinkoxyde V.H.Z.
 Weber & Heubach K.G.,
 Langelsheim (Harz)
 Gebr. Vossen & Co. Kommanditgesellschaft,
 Aachen
 Wacker-Chemie GmbH.,
 München
 Wasag-Chemie AG.,
 Essen
 Werag GmbH.,
 Roblingen bei Stuttgart
 Westdeutsche Bleifarbenwerke Dr. Kalkow AG.,
 Frankfurt/Main
 Westfälische Mineraloel u. Asphaltwerke W. H.
 Schmitz K.G.,
 Dortmund-Hafen
 Wiedes Carbidwerk Freyung GmbH.,
 Freyung (v. Wald.)
 Wilolin-Werk Willi E. Kohlmeyer K.G. Chemische
 und Lackfabrik,
 Bremen
 Wintershall AG.,
 Kassel
 Wirtschaftliche Forchung GmbH. Werk Langelsheim,
 Langelsheim (Harz)
 Wolff & Co.,
 Walsrode (Hann.)
 Zellstofffabrik Waldhof,
 Wiesbaden
 Zoellner-Werke Ges. für Farben- und Lackfabrikation
 M.B.H.,
 Berlin
 Zyma-Blaes AG. Chemische Fabrik,
 München 25

BELGIUM

L'Acide Carbonique Pur, S.A.,
 Molenbeek-Bruxelles
 Adjudel, S.A. des Produits Synthétiques,
 Lembecq-Hal
 L'Air Liquide, S.A.,
 Liege
 Ammoniaque Synthétique et Derives, S.A.,
 Bruxelles
 Atlantic Chemicals, A.C.S.A.B., S.A. Belge,
 Anvers
 Produits Chimiques d'Auvelais, S.A.,
 Auvelais
 Société Belge de l'Azote et des Produits Chimiques
 du Marly,
 Liege
 Belcolor, S.A.,
 Anderlecht-Bruxelles
 Compagnie Productrice des Borates, S. A.,
 Bruxelles
 S. A. des Bougies de la Cour et de Roubaix
 Oedenkoven,
 Oelegem
 Société Carbochimique, S. A.,
 Bruxelles
 S.A. des Engrais et Produits Chimiques de la
 Meuse (Chimense),
 Bruxelles
 La Citrique Belge, S.A.,
 Tirlemont
 Vernis Claessens, S. A.,
 Deurne-Anvers
 Cobenam, S.A.,
 Anvers
 Ets. Coene Pere & Fils, S. A.,
 Bruxelles
 Colles et Gelatines de Tournai, S. A.,
 Tournai
 Poudrerie Royal de Wetteren, Coopal & Cie., S.A.,
 Bruxelles

Saponnerie Couveur, S.A.,
 Schaebeck-Bruxelles
 Les Usines J.G. de Coninck & Fils, S.A.,
 Merxem-Anvers
 Société Belge des Couleurs et Vernis, (S.B.C.V.),
 S.A.,
 Anderlecht-Bruxelles
 S.A. des Usines Destree (S.A.U.D.),
 Haren-Nord-Bruxelles
 Anciens Ets. Hubert Dresse, S.A.,
 Bruxelles
 Société Belge d'Electrochimie (S.B.E.),
 Langerbrugge (Gand)
 S.A. Pour La Fabrication des Engrais Azotes
 (S.A.F.E.A.),
 Bruxelles
 Entreprises Chimiques et Electriques, S.A.
 ("Enchimex"),
 Bruxelles
 S. A. d'Engrais et Produits Chimiques Agricoles de
 Louvain,
 Wilsele-lez-Louvain
 Etudes et Recherches Industrielles E.R.I. S.A.,
 Bruxelles
 "Fabelta" S.A., Department "Plastiques,"
 Bruxelles
 Fabrique Nationale de Produits Chimiques et
 d'Explosifs (F.N.P.C.E.) S.A.,
 Boncelles-lez-Liege
 La Floridienne, J. Buttgenbach & Cie.,
 Bruxelles
 Produits Chimiques de Fontaine-l'Eveque "Pro-
 chimic" S.A.,
 Fontaine-l'Eveque
 Manufacture Franco-Belge de Couleurs & Vernis
 (F.B.C.V.) S.A.,
 Bruges
 S. A. des Produits Gallic,
 Bost-lez-Tirlemont
 Gelatines Hasselt & Vilvorde, S.A.,
 Bruxelles
 Photo-Produits Gevaert, S.A.,
 Mortsel-Anvers
 Comptoir Industriel & Agricole "Ginda" S.A.,
 Ans (Liege)
 Société Chimique du Hainaut, S.A.,
 Bruxelles
 Société Générale Métallurgique de Hoboken, S.A.,
 Hoboken-lez-Anvers
 Compagnies Réunies des Huilleries du Congo Belge
 et Savonneries Lever Frères (Huilevier), S.A.
 Belge,
 Bruxelles
 Manufacture de Produits Chimiques du Nord,
 Etablissements Kuhlmann, S.A. Francaise,
 Bruxelles
 S.A. des Usines Lavenne Frères,
 Dour (Hainaut)
 S. A. des Usines Georges Levis,
 Vilvorde
 Produits Chimiques du Limbourg, S.A.,
 Bruxelles
 La Metallo-Chimique, S.A.,
 Bruxelles
 Bleu d'Outremer & Couleurs de Mont-St-Amand,
 S.A.,
 Mont-St-Amand-lez-Gand
 Produits Chimiques de Nieuport, S.A.,
 Bruxelles
 Oleochim, S.A.,
 Bruxelles
 L'oxydrique Internationale S.A.,
 Bruxelles
 Palmafina, S.A.,
 Bruxelles
 Nouvelle Société Persil, S.A.,
 Bruxelles
 Société Chimique des Derives du Pétrole "Petro-
 chim,"
 Anvers
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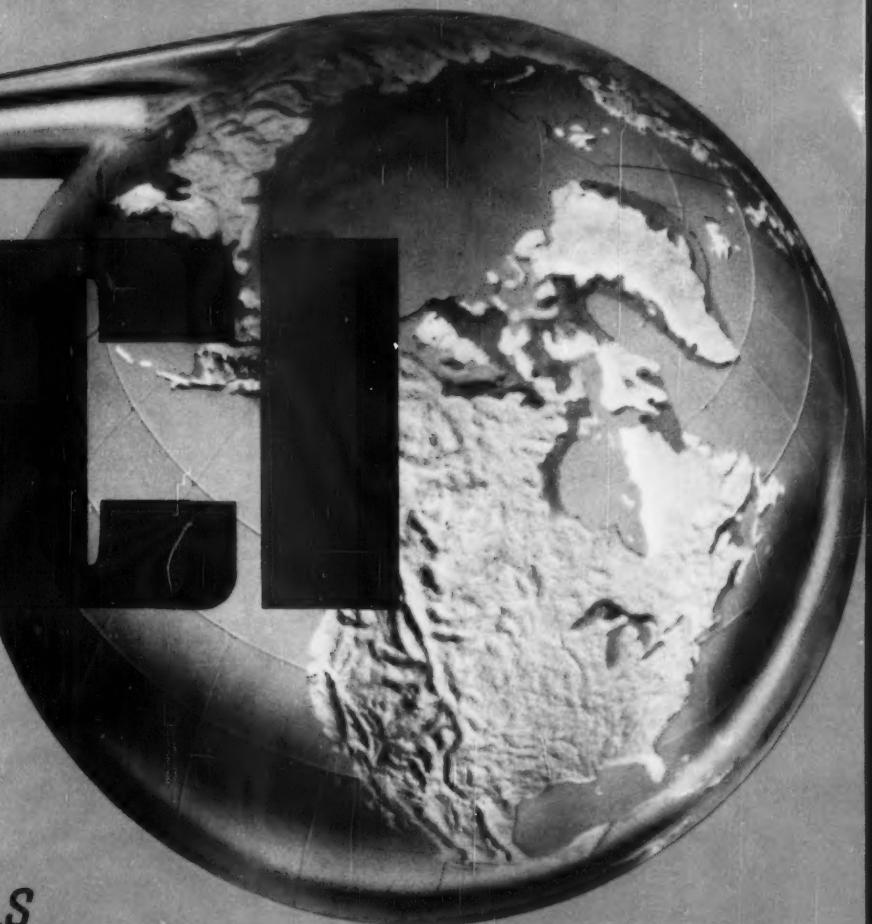
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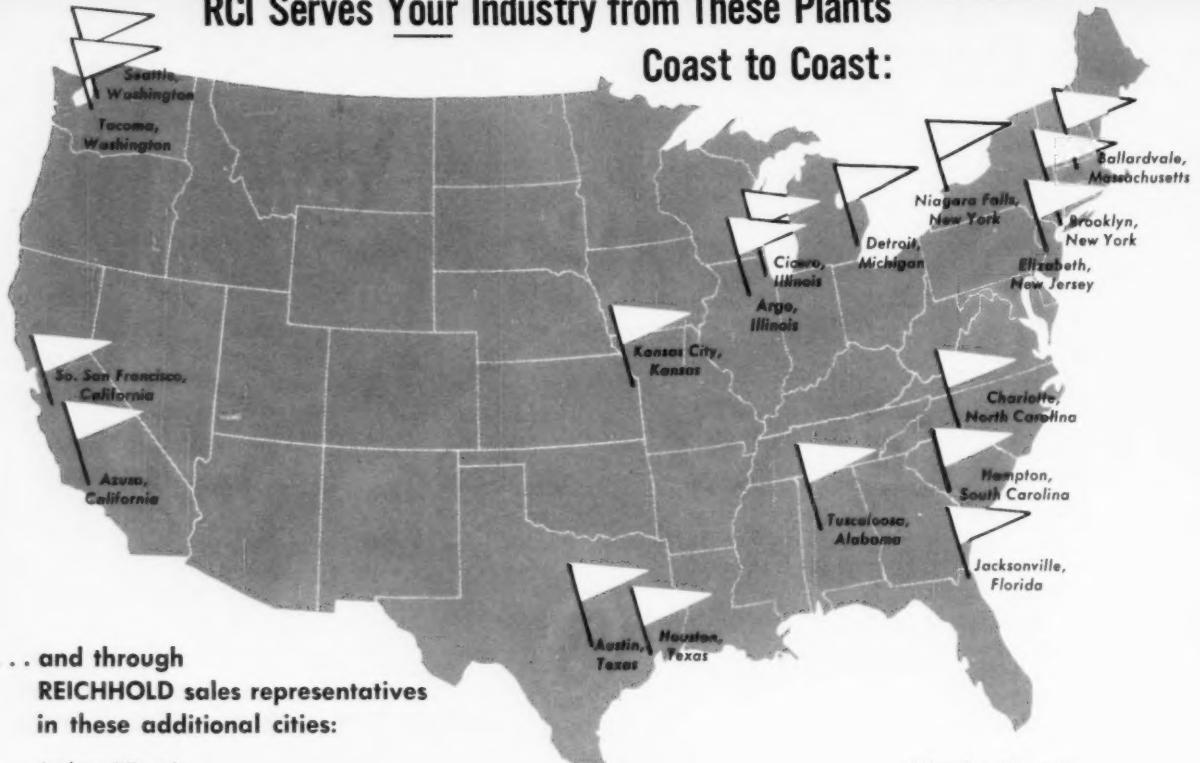
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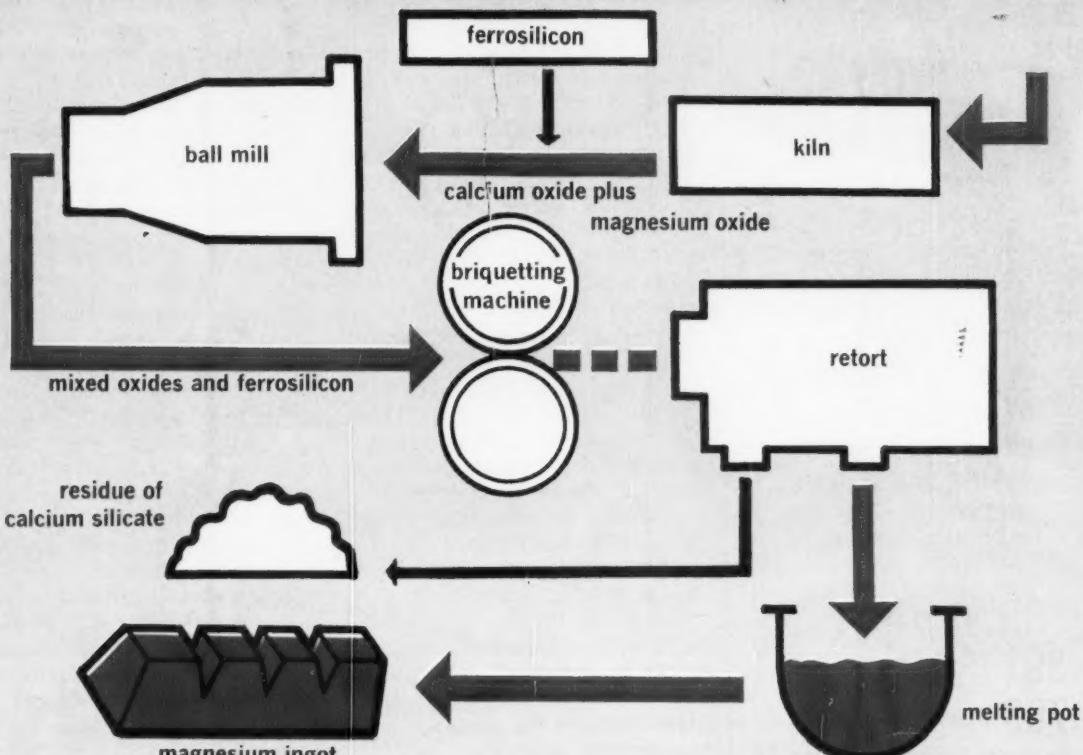
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Alamet's Route to Magnesium



Novel Magnesium Route Competes on Costs

With Alabama Metallurgical Corp.'s new magnesium plant now operating at its full, 6,000-tons/year capacity, the Pidgeon process appears to have proved its economic feasibility in the competitive primary magnesium business.

Alamet's Selma, Ala., plant has been producing the metal by ferrosilicon reduction of magnesium oxide (see flowsheet above) since last August, and its managers now feel it's on an equal footing with electrolysis of magnesium chloride from sea water.

The technical feasibility of the Pidgeon process was proved dramatically during World War II and the Korean War when it was employed in seven plants needed to supply military requirements. But without the impetus

provided by a national emergency, it has not been able to pay its way in peacetime markets.

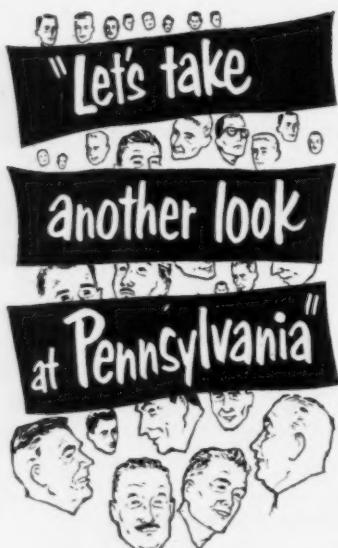
Ups and Downs: One reason for the lack of concentrated effort to open an alternate competitive route to primary magnesium in the past was the uncertainty of the market picture. Dow Chemical had the cheapest process and more than enough capacity to satisfy peacetime requirements. And since its sea water process requires a large installation, less economic processes were the only roads open to small producers.

Under government sponsorship, magnesium processing capacity hit an all-time high of 184,000 tons/year in 1943. But Dow's Freeport, Tex., plant was the only one to remain in opera-

tion just after World War II, when annual magnesium production fell to 6,000 tons. It climbed again to 81,000 tons in '57, then plummeted once more in '58. This gave little encouragement to new producers. Now magnesium seems to be climbing at a stable rate (CW, June 4, '60, p. 71).

With this more predictable pattern emerging, Alamet's owners (Calumet & Hecla, 70%; Brooks & Perkins, 30%) decided the time was ripe for its move. A study of the field indicated the plant would be welcomed by potential large-volume consumers, such as the automotive industry, which admits it has shied away from magnesium as long as there was but one supplier.

Calumet & Hecla's first job was to select one of the two basic processing



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routes: electrolysis or thermal reduction.

Process Rundown: In the electrolytic processes, the source can be either dolomite (magnesium carbonate mixed with calcium carbonate) or sea water. In the case of dolomite, the quarried stone is crushed and calcined to magnesium oxide and calcium oxide, the calcium oxide leached off, and the magnesium reacted with chlorine to make magnesium chloride for the electrolysis. In the case of sea water, the magnesium dissolved in the sea is precipitated as magnesium hydroxide by treating the water with slaked lime. Then the magnesium hydroxide is reacted with hydrochloric acid to make magnesium chloride for electrolysis.

In the conventional Pidgeon thermal reduction process, a mixture of magnesium oxide (generally from calcined dolomite) and calcium oxide is heated with ferrosilicon; magnesium metal is vaporized, leaving a slag containing the calcium along with impurities. The reaction is carried out under vacuum so that the magnesium sublimes out of the reacting mixture and condenses as high-purity metal. The difficulties encountered in this process are mostly handling problems. It is difficult to operate a large furnace under vacuum; removal of the solid magnesium from the condenser presents problems.

Except for this, the operating steps are relatively simple. Dolomite is crushed and calcined to a mixture of magnesium oxide and calcium oxide. Ferrosilicon is added, and the mixture pressed into briquettes. The briquettes are then fed directly into the reaction furnace heated by either gas or oil.

Alamet's Plant: For Alamet's plant at Selma, a radically different version of the Pidgeon process was developed. There is no single key to its economic operation—rather, many minor improvements resulting from modern technology, such as steam jet evacuation, have been combined to make production costs competitive with Dow's Freeport plant.

In contrast to some of the older Pidgeon process plants, the Alamet plant is operated batchwise, with materials handling systems similar to modern operations in the steel industry. The plant is laid out in a big T. In the long central leg, 10 giant gas-fired furnaces, each about 40 ft. long by 12 ft. high by 15 ft deep, are

lined up. On the inside of each furnace are a horizontal row of 12-in.-diameter tubes—the reaction retorts.

At the end of the line of furnaces, the preparing and melt rooms join at the cross of the T. In the preparing room are facilities for crushing and grinding dolomite and mixing it with ferrosilicon, as well as the briquetting machine. Opposite is the melt room, where magnesium metal is pushed out of the condensers, remelted, and cast into pigs or ingots.

At Alamet, briquettes are loaded into the retorts and pushed to the end inside the furnace. A round radiation shield, which is baffled to stop radiation while permitting vapors to pass, follows the briquettes. Then a condensing sleeve is pushed in after the radiation baffle, a sodium shield fitted in after this. This unit collects sodium, which might be present in the dolomite and which will distill over before the magnesium. Finally, the operating end is sealed and the retort put under vacuum.

The reaction cycle lasts about eight hours, after which the retorts are opened, and the condensing sleeve removed to the melt room, where the magnesium is pressed out in a "crowning" machine. The residue of solid slag in the retorts is scooped into buggies which travel along the line of furnaces.

Although it is too soon for Alamet's engineers to determine minimum production costs for its plant, they say they have no trouble meeting current prices of 35.35¢/lb. for pigs, 36¢/lb. for ingots, and 41¢/lb. for high-purity magnesium.

Magnesium's price history shows that the cost of primary metal will hardly dip below this, although Dow held prices at 20.5¢/lb. through World War II. After the war, they jumped to 24.5¢, were controlled there until '53, when they rose to 27¢. Rising costs of labor, power and raw materials forced them up through '55-'56 to the current 35.25¢/lb.

However, it is Alamet's intention to bring more than an improved process to the industry. At the startup of the plant, H. Y. Bassett, president of Calumet & Hecla, declared the company's intention to continue research in both production and application areas. The corporate philosophy, according to Bassett: "We don't go along for the ride."



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*U.S. Patent 2,389,608

Other interesting, cost-saving uses of NADONE are:

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- As a degreasing solvent or fortifier for lower-power degreasers.
- To make better paint removers, inks, adhesives, pesticides, etc., etc.

WRITE FOR TECHNICAL BULLETIN 1-19C

This 32-page bulletin gives details on these and other applications of NADONE, contains complete properties, reactions and a valuable list of 148 literature references. We'll gladly send you a copy of this bulletin and, if you wish, a liberal working sample of NADONE for your investigations.

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Nuclear Fuel Twist

Underscoring private industry's desire — and capability — to put nuclear processing on a competitive basis is a recent contract to Mallinckrodt Nuclear Corp. (St. Louis, Mo.). It will supply 1,200 kilograms of enriched uranium metal to Argonne National Laboratory.

Argonne's order — for the largest amount of highly enriched metal ANL has yet sought in a single procurement — will be made by a new conversion process recently installed at Mallinckrodt's Hematite, Mo., plant (Oct. 27, '56, p. 106).

The new process features a novel reduction operation — the first step in making metal from the enriched uranium hexafluoride supplied from the Atomic Energy Commission's gaseous diffusion plant. The conventional route, employed by AEC installations and by Davison Chemical's nuclear feed-materials plant (CW, March 8, '58, p. 44), involves reducing the hexafluoride with hydrogen at 1200 F to obtain the tetrafluoride (green salt) and hydrogen fluoride.

For the new operation, Mallinckrodt researchers developed a system using a liquid organic reducer (unidentified) that's said to offer several advantages over the hydrogen-reduction route.

First of all, the new technique eliminates two tricky steps: (1) handling by-product hydrogen fluoride (either recovering it or discharging to waste); (2) separating uranium tetrafluoride dust that becomes entrained in the gaseous by-product.

The latter consideration isn't critical for AEC plants handling large quantities of material of the same enrichment on a fairly regular production schedule. But it is important to processors like Mallinckrodt whose plants must handle smaller lots of varying enrichment. The ability to recover the uranium tetrafluoride by filtering it out of the organic reducing medium simplifies the job of changeover between production runs on fuels of different assay values.

Moreover the liquid organic reducing system is physically smaller than one having comparable capacity to handle gaseous materials.

The new installation at Hematite is also credited with producing con-

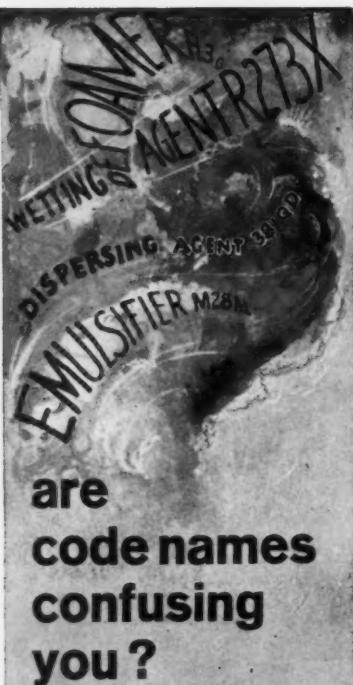
sistently high-purity product. The average, says Mallinckrodt, is 99.95%, which is actually higher than the purity requirement specified in the ANL contract. Although there's no apparent reason why hydrogen reduction of uranium hexafluoride shouldn't produce comparable purity, it's likely that the new route may save some purification steps required in Mallinckrodt's older process. Previously, tetrafluoride for metal production at Hematite was made by hydrofluorination of uranium dioxide. The new method is more direct, saves going through the ammonium diuranate process of converting hexafluoride into dioxide.

While organic reduction will work on material of any enrichment, the company feels its greatest value will be realized in the processing of highly enriched fuel. Reasons: highly enriched uranium is handled in smaller quantities, requires short residence times and high accountability. Under the ANL contract, Mallinckrodt carries the full financial responsibility for the more than \$20 million worth of material from the time AEC delivers the hexafluoride until the metal goes to ANL. And with material valued at \$16,000/kilogram, it's easy to understand why it's essential to have a process capable of cutting losses to the minimum.

Final conversion of the uranium tetrafluoride into metal will be performed by conventional reduction techniques. Mallinckrodt helped to perfect these metal processes in its capacity as operator of AEC's St. Louis and Weldon Spring, Mo., plants.

End-use for the highly enriched metal: fuel for the ZPR-6 fast reactor, a new experimental unit designed to study fuel configurations and the effects of such fuels on reactor construction materials.

Mallinckrodt Nuclear Vice-President F. M. Belmore says it's significant that this material is being supplied by a private participant in the nuclear field "on a competitive bid basis." The company's thrice expanded Hematite plant, together with its research activities in the nuclear field, reflect Mallinckrodt's confidence in the growing opportunities for private participation by commercial firms.



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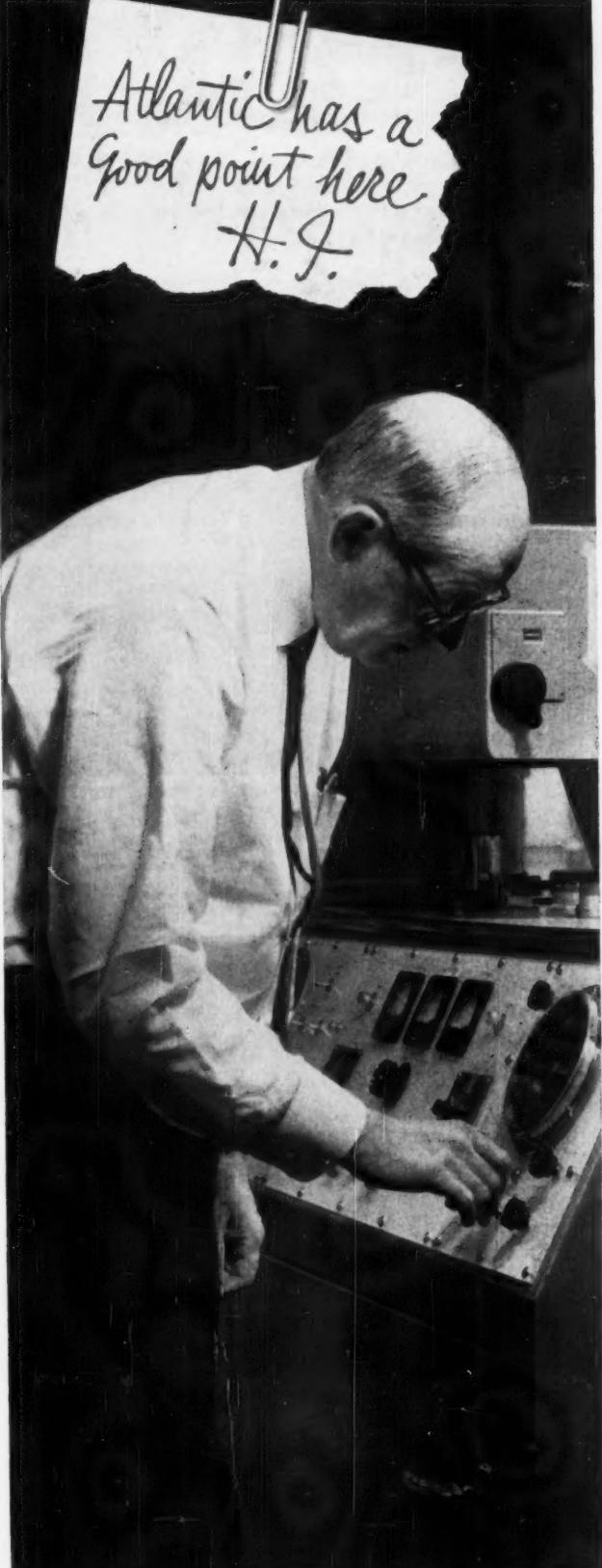
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ENGINEERS AND CONSTRUCTORS FOR INDUSTRY

NEW SHELL PROCESS ETHYLENE-OXIDE PLANT TO GO ON STREAM FOR OLIN MATHIESON IN 1960

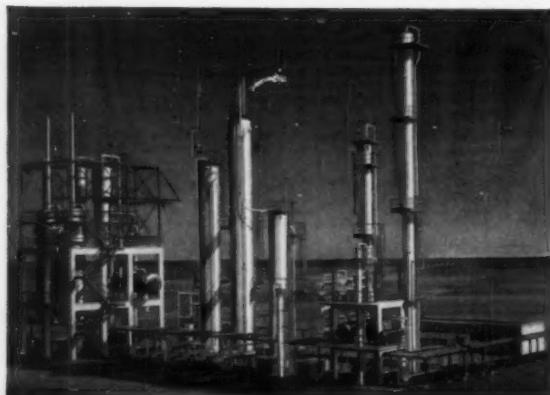
Olin Mathieson Chemical Corporation's new ethylene oxide plant at their Doe Run works, at Brandenburg, Kentucky is scheduled to go on stream late in 1960.

Engineered and constructed by The Lummus Company, the plant will employ the Shell Development Company's process for the direct oxidation of ethylene to ethylene oxide. The ethylene oxide product will be converted into derivatives for use in the manufacture of antifreeze, industrial coolants, hydraulic brake fluids, detergents and chemical intermediates.

Feed for the new plant will come from Olin Mathieson's ethylene plant, also located at Doe Run.

The new plant is part of a recently announced \$30 million expansion program for Olin Mathieson's Chemicals Division. It is the fourth Shell process ethylene-oxide plant to be designed, engineered and constructed by Lummus in the last several years. The other three are operated by Calcasieu Chemical Corporation, at Lake Charles, La.; Wyandotte Chemical Corporation at Geismar, La.; and Petrochemicals, Ltd. at Partington, England.

For ethylene oxide and ethylene glycol, or for any type of chemical or petrochemical plant, Lummus' half century of world-wide experience on more than 850 plants for the process industries is at your disposal.



'SHELL' HDS UNIT FOR KOPPARTRANS OLJEAKTIEBOLAG

This Catalytic Desulfurisation Unit for treating 8000 BSD of Catformer feedstock is the latest addition by Lummus to the modern processing facilities at Koppartrans' Gothenburg Refinery. It utilizes the 'Shell' Vapor Phase Catalytic Process and provides the high quality low sulfur naphtha required for the ultimate production of high octane gasoline. Lummus has engineered and built a large number of similar hydro-desulfurisation plants all over the world. This is the latest in Europe. Lummus installed the successful prototype unit for Shell at their Stanlow Refinery in England.

B²R²

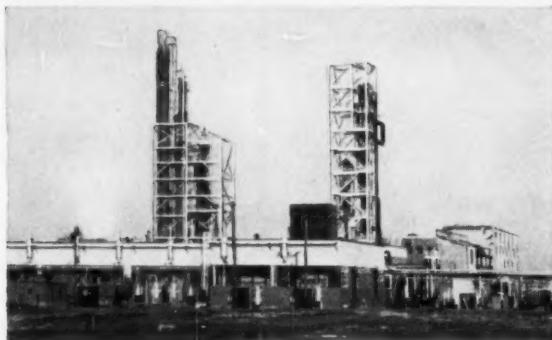
AEC Selects Lummus for Architect-Engineering and Construction Services on \$10 Million High Flux Beam Research Reactor

The Atomic Energy Commission has selected The Lummus Company for architect-engineering and construction services on a proposed \$10 million research reactor.

At the time of the selection, the A.E.C. said it had chosen the Lummus proposal as a basis for contract negotiations for a 20,000-thermal kilowatt, high-flux reactor. The installation will be built at the A.E.C.'s Brookhaven National Laboratory in Upton, N.Y. Curtiss-Wright Corporation will serve as the nuclear engineering subcontractor to The Lummus Company.

The reactor, authorized by Congress, will produce a high neutron flux—that is, a high intensity of neutrons. It will be used for such research projects as: studying the composition of solid materials, producing isotopes, and research on nuclear particles.

Ethylene Plant Expansion on Stream for Canadian Industries Limited



LUMMUS DESIGNS AND ENGINEERS 85% EXPANSION OF ETHYLENE PLANT AT EDMONTON, ALBERTA, CANADA

Expansion of C-I-L's ethylene facilities at Edmonton, Alberta, Canada, is completed and the plant now has a capacity of 46 million lbs. per year of high purity ethylene. The entire output of this unit is used by C-I-L to manufacture polyethylene.

Lummus designed and engineered the expansion of the existing cracking facilities, built in 1953, for the increased production of ethylene, and the ethane recovery unit for extracting ethane from natural gas.

As originally designed, the plant recovered ethylene from the cracking heater effluent and ethane from natural gas by oil absorption. In the expanded plant, additional capacity is obtained by withdrawing the natural gas portion and increasing the heater effluent.

The new low temperature ethane recovery plant

has a demethanization unit which utilizes ethylene refrigeration to temperatures as low as -145°F. At C-I-L's request sufficient capacity has been designed into this unit to permit another expansion step in the future.

Up-to-date equipment was employed to ensure economical and efficient operation. Special efforts were made, wherever possible, to incorporate existing equipment into the expanded plant.

In addition to the C-I-L expansion project, Lummus has designed 13 complete ethylene plants, with a combined total capacity of over one billion pounds per year.

Lummus Appoints General Creasy To Head New York Division

DR. S. Z. AVEDIKIAN SUCCEEDS CREAMY AS DIRECTOR OF ENGINEERING DEVELOPMENT CENTER

William M. Creasy—Major General, U.S. Army retired—a Vice President of The Lummus Company, has been appointed to head the company's New York Division. At the same time, Dr. S. Z. Avedikian is joining The Lummus Company as Director of the Engineering Development Center in Newark, New Jersey. He succeeds General Creasy, who was formerly Director of the Engineering Development Center.

Previous to joining Lummus in 1958, General Creasy had served as Chief Chemical Officer of the



Major General William M. Creasy (U.S. Army retired) — who has been appointed to head Lummus New York Division.

Army since 1954. In this position, he was in charge of the Army Chemical Corps, whose activities include large-scale research and development, engineering, training and procurement in chemical, biological and radiological warfare. General Creasy received his B.S. degree from the United States Military Academy in 1926, and an M.S. degree in Chemical Engineering Practice from M.I.T. in 1936.

Before joining Lummus, Dr. Souren Z. Avedikian of Princeton, New Jersey, was co-founder of Avedikian and Company in 1932, Tidings Corporation of America in 1947, and S. Z. Avedikian & Associates in 1959. Holder of about 30 U.S. and foreign patents, Dr. Avedikian has been engaged in the research and development of processes and products for over 25 years, concentrating in heavy and fine chemicals, plastics, textiles, pharmaceuticals, paper, food processing, and amalgam cells.

Over a half-century of Process-Industry experience

Here is just a partial list of chemicals for which Lummus has designed, engineered or constructed plants:

Acetone	Dichlorethane	Nitric acid
Acrolein	Dichlorobenzene	Phenol
Allethrin	Di-isobutyl alcohol	Phthalic anhydride
Ammonia	Ethylbenzene	Polyvinyl alcohol
Ammonium nitrate	Ethyl chloride	Polyvinyl pyrrolidone
Ammonium sulfate	Ethylene	Propargyl alcohol
Benzol	Ethylene glycol	Propylene
Beryllium metal	Ethylene oxide	Pyrrolidone
Bisphenol	Epon® resin	Styrene
Butadiene	Formaldehyde	Sulfuric acid
Butanediol	Heavy water	Surfactants
Butynediol	Hydrogen	Tetramer
Butyrolactone	Hydrogen sulfide	Trichlorethylene
Carbon black	Isopropyl alcohol	Trichlorobenzene
Caustic soda	Lamp black	Toluene
Chlorobenzene	Magnesium sulfate	Uranium oxide
Cumene	Mercuric nitrate	Vinyl acetate
Di-ammonium phosphate	Naphthalene	Vinyl pyrrolidone

Discuss your next chemical or petrochemical project with a Lummus representative.

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Aircraft manufacturers use RTV for pressure sealing of cabins and cockpits, fire walls, fuel tanks and hot air ducts. Protection for electronic packages is provided by caulking assemblies and sealing seams and lead holes with RTV.

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Good electrical properties and outstanding heat resistance have led to RTV's use in coil impregnation and encapsulation of motors and transformers. Can be poured, sprayed, painted, or applied by dipping. Cure times can be varied from minutes to several days.

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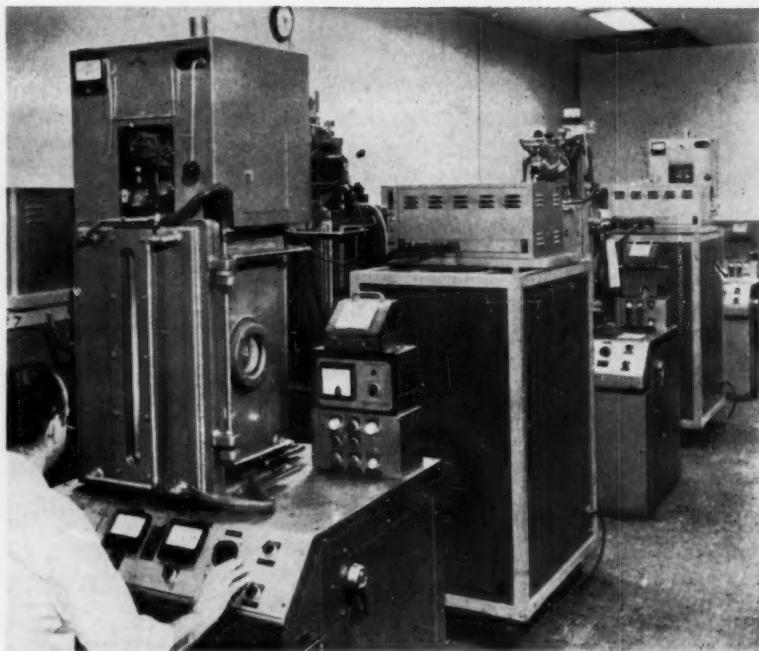
*Room Temperature Vulcanizing

For more information and a free test sample, write (briefly describing your application) to General Electric Company, Silicone Products Department, Section 11, Waterford, N.Y.



**GENERAL
ELECTRIC**

ENGINEERING



Part of Merck's battery of floating-zone units for making silicon.

Vacuum Route to Silicon

Merck & Co's. Electronic Chemicals Division took the wraps off its facilities for commercial production of high-purity silicon this week. It displayed, in its Cherokee plant at Danville, Pa., row after row of Stokes vacuum chambers (see cut), where silicon rods are purified by the floating-zone method. The new units are convincing evidence that high vacuum is a competitive technique whenever inert atmospheres are required.

The new units, moreover, as one of several recent expansions at Merck, reflect the continued expansion in markets for high-purity silicon.

Although there is economic pressure for lower-purity, cheaper silicons (CW, Oct. 10, '59, p. 65), the demand for high-purity silicons continues to expand. Almost all this ultra-pure silicon goes into electronic gadgets such as current rectifiers and transistors. Pure silicon gains its edge over other materials from its resistance to electricity — 300,000 ohm-centimeters (o-cs), compared with 60,000 o-cs for pure germanium, 1,000 o-cs for boron-containing silicon, and one 10-millionth o-cs for copper. In general, the size of the electron de-

vices increases as the resistance of the material decreases, so high purity permits smaller parts.

In practice, however, most silicon is "doped" with controlled amounts of impurities such as boron and phosphorus to give it the qualities of a semiconductor. That is, material which has a specified electrical resistance at a given temperature. Yet even in this instance the starting material has to be pure silicon, so that exact impurity content can be controlled by accurate addition of doping agents. Typical doping dose: one atom of impurity for every 500 million atoms of silicon, compared with one part in 6 billion for the pure silicon.

As might be expected, the ultra-high purity is expensive. Merck sells its pure polycrystalline billets for \$276/lb. in lots smaller than 5 lbs. and for \$258/lb. in lots above 5 lbs. With total silicon production in the U.S. estimated at 140,000 lbs. this year (of all grades), the economic importance of controlled-purity silicons becomes apparent.

Floating Zone: The floating-zone method of purification Merck uses was first worked out on germanium. Its

DIALKYL- CHLOROALKYLAMINE HYDROCHLORIDES

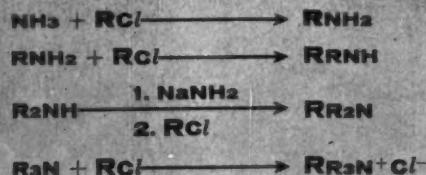
FACILE WORKING TOOLS FOR . . .

$\mathbf{RCl} \cdot \mathbf{HCl}$

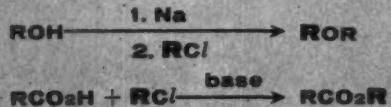
$\mathbf{R} = \text{Me}_2\text{NCH}_2\text{CH}_2 -$	(DMC*)
$\text{Et}_2\text{NCH}_2\text{CH}_2 -$	(DEC*)
$\text{iPr}_2\text{NCH}_2\text{CH}_2 -$	(DIC*)
$\text{Me}_2\text{NCH}_2\text{CH}_2\text{CH}_2 -$	(DMPC*)
$\text{Et}_2\text{NCH}_2\text{CH}_2\text{CH}_2 -$	(DEPC*)
$\text{Me}_2\text{NCH}_2\text{CH}(\text{CH}_3)\text{CH}_2 -$	(DMMPC*)
$\text{Me}_2\text{NCH}_2\text{CH}(\text{CH}_3) -$	(DMIC*)

*Michigan Chemical product names for the chloride hydrochloride form of \mathbf{R} . All commercially available.

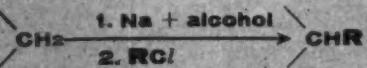
Alkylation of amines:



Alkylation of alcohols and acids:



Alkylation of active methylene groups:



Formation of Grignard reagents:



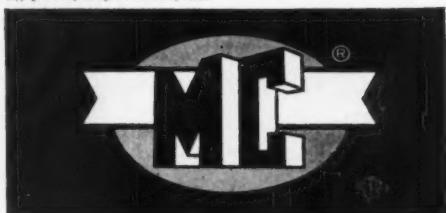
Reaction with metal salts:



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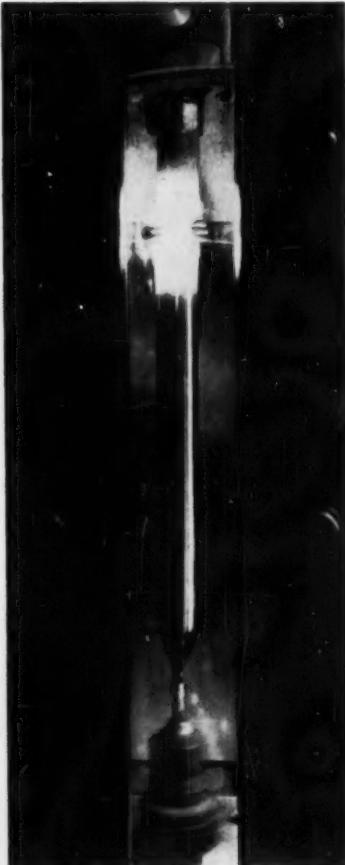
ENGINEERING

application to silicon was originally reported by P. H. Keck and M. J. E. Golay in 1953.

The principle is fractional crystallization. A melted zone is moved through the length of a silicon rod. Inside the molten portion, which is kept from running off by silicon's high surface tension and low density, the impurities are free to flow. Although there is no separation effect at the interface where the silicon begins to melt, pure silicon crystals tend to form first at the freezing interface, crowding impurities into the molten section. Thus, the impurities are swept along the rod as the floating molten zone moves toward the end.

In commercial practice, this technique is applied to 1-in.-diameter rods about 22 in. long. Heat comes from an induction coil. And the melting-sweeping operation is repeated several times during the course of several hours, until the desired purity is obtained.

A view of the molten, floating zone.



At Merck's Danville plant, several dozen floating-zone machines, designed by F. J. Stokes Corp. (Philadelphia), are set up back to back in long rows. Each unit consists of a vacuum chamber mounted on a control desk the size of an ordinary office desk. At the left of each desk, a cabinet the height of a man houses electrical controls. The vacuum compressor is mounted on top of the chamber.

The machines run under automatic control. An operator hand-mounts the 2-ft.-long rod of semipure silicon vertically in the vacuum chamber, fastening it into jaws, which support it at the ends. He sets automatic controls to regulate the rate at which the induction coil moves down the length of the rod; he seals the chamber, and starts the compressor to achieve vacuum. Once in operation, the machine can run automatically for several hours, and one operator can thus supervise several machines at a time.

Vacuum versus Argon: Merck is not the only company commercially producing pure silicon billets by zone refining. Du Pont has a similar installation at its Brevard, N. C., plant, and W. R. Grace has an installation in Puerto Rico. However, both Du Pont and Grace use an argon atmosphere for processing the bulk of their rods, with a few machines set up to operate under vacuum for customers that insist on it. Merck, on the other hand, purifies all its silicon under vacuum.

Vacuum, Merck says, has four advantages: (1) it is cheaper; (2) it increases the evaporation of phosphorus; (3) there is less opportunity for contamination from the "atmosphere"; and (4) it prevents corona discharge from the induction coil.

In the Stokes machines, vacuum is pulled by a 13-cu.ft./minute compound mechanical pump, operating through a 6-in. water-cooled oil diffusion baffle. In about one-half hour, this equipment can reduce the pressure in the chamber from atmospheric to extremely low operating pressures on the order of 0.0000004 in. of mercury. This is below the vapor pressure of phosphorus.

More Expansions: Support on Merck's bet that markets for high-purity silicon will continue to expand comes from Du Pont, which is in

BRIEFS

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On the basis of combined sulfur, sodium sulfhydrate is a far better buy than sodium sulfide. You get 62.6% more sulfur for a given weight of both products, which gives the sulfhydrate an edge of 6.3¢ a pound.

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IT'S IN THE "JOURNAL"

If you've ever wondered about the mechanism for the reaction of phosphorus pentachloride with ketones, we refer you to the August 20, 1959, *Journal of the American Chemical Society* for an interesting article offering several equations you may find useful. Incidentally, we make phosphorus pentachloride, a yellowish crystalline powder with a melting point of about 148°C. under slight pressure. Ordinarily it sublimes at about 160°C. at atmospheric pressure. Among its uses: a substitute for the oxychloride to obtain trichresyl phosphate; as a general chlorinating agent and catalyst; for organic synthesis. It finds much of its usefulness in pilot plant applications where its solid state is suited to small reactors. Check coupon for data.

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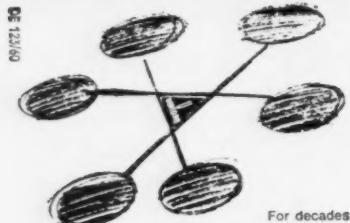
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Chemical Structure: sulfonated polystyrene copolymer in hydrogen form
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ENGINEERING

the process of doubling its capacity for the ultrapure silicon. Du Pont says it now makes a little over 70,000 lbs./year of all types of silicon (neither Merck nor Grace would give production statistics).

These figures indicate estimates of 140,000 lbs./year of total U.S. production might well be conservative. In any case, high-purity silicon is rapidly becoming a major industry and its method of production takes on increasing importance.

New Route to Sulfate

North American Coal Corp.'s projected, \$1.3-million plant to make aluminum sulfate from mine wastes (*CW*, p. 24, June 4) now appears likely to have far-reaching significance to the process industries. The new plant will produce 40,000 tons/year of aluminum sulfate containing 17% aluminum oxide — about 4.5% of the total U.S. capacity. And it may presage a new route to aluminum metal.

Although this represents an interesting use for mine wastes (aluminum sulfate sells for about \$35/ton, and the plant is designed to gross about \$1.4 million/year), its long-range effect — the possibility of processing wastes to aluminum metal — is even more important. There is approximately 5% aluminum in the wastes (left from North American's modern mining methods, which are less selective than hand miners).

The aluminum sulfate process is licensed from Strategic Materials Co. (New York). Aluminum is dissolved out of the clay with concentrated sulfuric acid. The resulting slurry is filtered to remove silica residue and other solid impurities; and the aluminum sulfate crystallized in agitated tanks. Finally, low-iron aluminum sulfate crystals are separated in rotary filters. Equipment is made of the acid-resistant materials used in the conventional equipment for extracting aluminum sulfate from sulfuric acid and bauxite.

Although North American is not yet willing to talk about subsequent processing routes, indications are that it will be able to convert the aluminum sulfate into aluminum oxide (alumina) by sintering it and recovering the sulfuric acid. In doing this it will bypass the conventional Bayer proc-

ess, which makes alumina by digesting bauxite in concentrated sodium hydroxide and then calcining the hydrate of alumina. And its resulting alumina would contain less soda impurities and have superior abrasive properties. The next possibility: with coal from the producing mines as a power source, the alumina could finally be converted into aluminum metal.

The mine North American has chosen for its pilot project is in Powhatan, O., on the coal vein called Pittsburgh No. 8. This vein extends over 5,000 sq. miles in Ohio, western Pennsylvania, West Virginia and Maryland and has reserves estimated at 10 billion tons in veins over 31 in. thick. If North American's process works out, the Powhatan mine, which produces 6,500 tons/day of coal, would be able to produce 50,000 tons/year of aluminum metal. And the Pittsburgh No. 8 vein would have reserves of about 200 million tons of aluminum.

Disulfide from Oil

A new process to produce carbon disulfide is being pushed this week as a potential successor to the older charcoal processes and the relatively new methane route. The new method utilizes liquid petroleum fractions as feedstock, is now ready to move into the pilot development stage.

The technique was developed by Carlisle Thacker, technical director at Taylor Fibre Co. (Norristown, Pa.). (During his former association with the Pure Oil Co., Thacker was also involved in the original development of the methane process.) Since carbon disulfide falls outside the scope of Taylor Fibre's activities, Thacker is seeking to interest other companies in the pilot-plant development of his latest brainchild.

Sulfur Savings: Although it's still too early to disclose details of the fuel oil process, Thacker reports that the reaction steps have been demonstrated on a small scale. The major difference between the conventional methane process and the new one: a significant reduction in the amount of by-product hydrogen sulfide.

Because methane contains four hydrogen atoms for every carbon atom, about one-third of the sulfur used in the methane process winds up

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as by-product hydrogen sulfide. Thacker's new process, on the other hand, uses feedstocks with much lower hydrogen-to-carbon ratios (e.g., 1.4-to-1 for gas oil, 1-to-1 for heavy residuum), yields a correspondingly lower quantity of hydrogen sulfide.

Thacker estimates that lower hydrogen content of the feed has these effects: only about one-half as much sulfur must be vaporized and superheated per ton of carbon disulfide produced; yield per mole of reacted gases may be increased by 30-100% (depending on the particular feed used); gas-handling in recovery and purification system may be halved.

Over-all evaluation studies indicate that the fuel oil route will require about 25% less for plant investment, 15% less for production costs than the methane process.

Thacker expects the new process to interest foreign producers in areas where methane is unavailable, or where requirements are too small to justify (on an economic basis) a methane process installation.

Such considerations don't rule out the potential interest of domestic firms, Thacker adds. The general availability of suitable petroleum feedstocks and the process's adaptability to low-volume production would likely make it attractive for captive carbon disulfide production. And even the major producers, like Stauffer Chemical and Food Machinery and Chemical Corp.'s Chlor-Alkali Division, may find it attractive for expansions or replacements of existing production facilities. However, none of the large producers knows enough about the new route to comment on possible future interest.

Growing Need: Based on its current use rayon tire cord, plus growing requirements of other major carbon disulfide-consuming chemicals (cellophane and carbon tetrachloride), Thacker expects carbon disulfide output to top 600 million lbs. this year. And the outlook for the next 10 years, he predicts, will see continuing expansion of the industry at a rate of 20 million lbs. each year.

Considering that more than 300 million lbs. of annual capacity consists of older charcoal-retort plants—many of which are now obsolescent—the growth forecast offers fair assurance that the fuel oil route will have a good chance of success—provided it lives up to Thacker's expectations.

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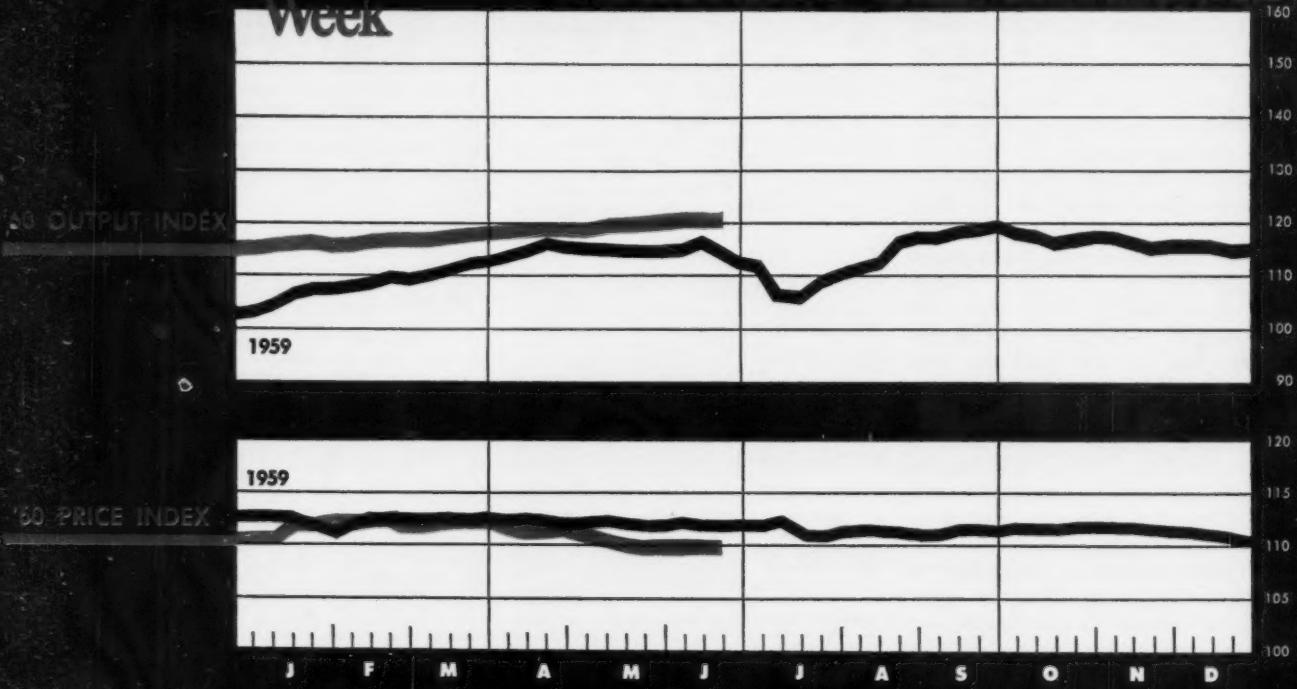
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JUNE 18, 1960

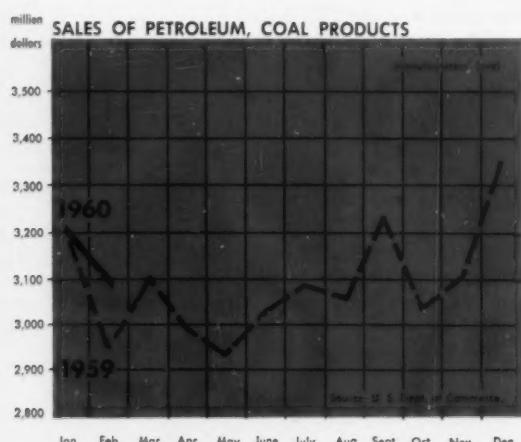
WEEKLY BUSINESS INDICATORS

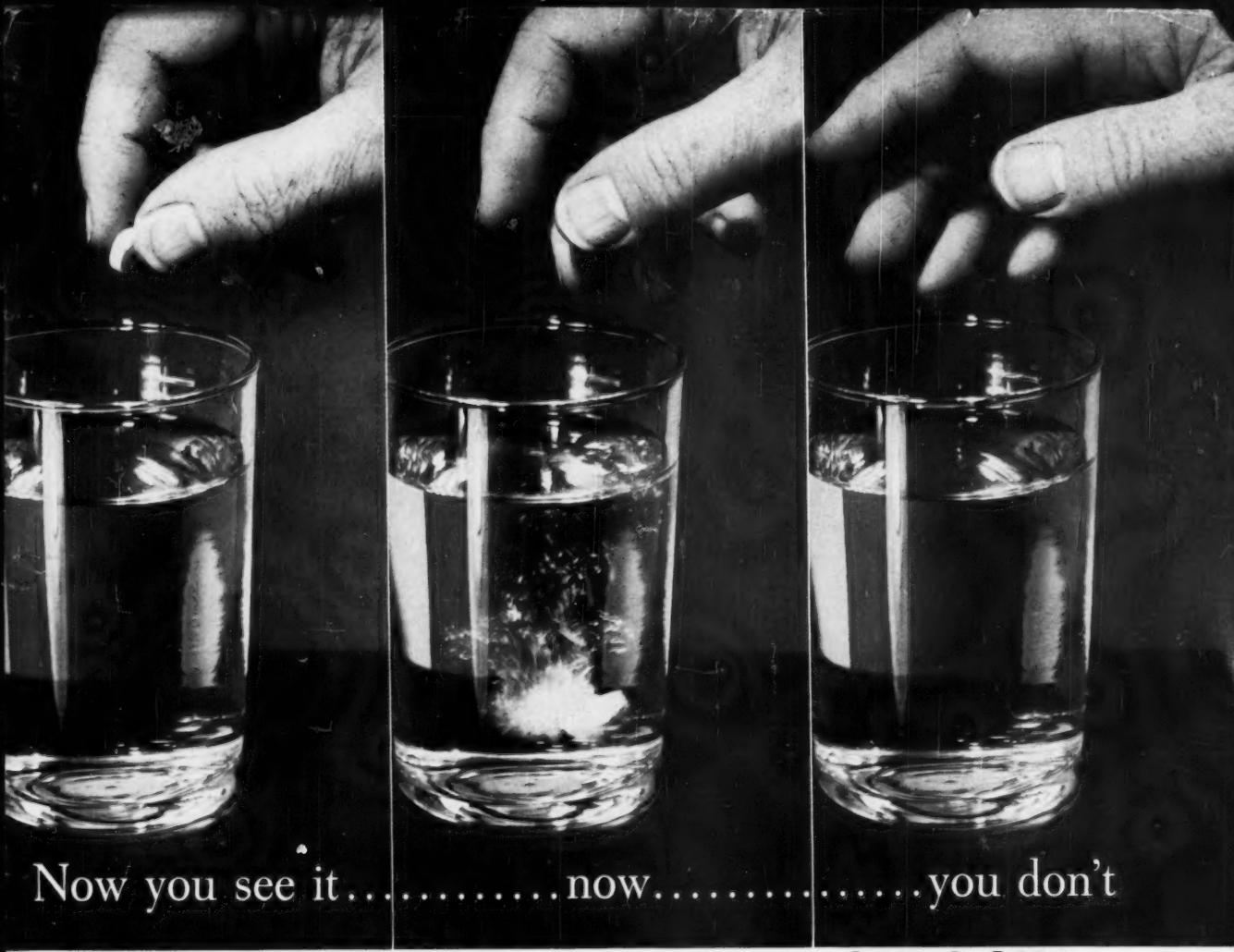
WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Chemical Week output index (1947-1949=100)	121.8	121.6	117.5
Chemical Week wholesale price index (1947=100)	108.5	109.0	110.8
Stock price index (12 firms, Standard & Poor's)	52.45	50.96	56.93
Steel ingot output (thousand tons)	1,775	1,726	2,604
Electric power (million kilowatt-hours)	13,134	13,572	13,023
Crude oil and condensate (daily av., thousand bbls.)	6,781	6,815	7,032

TRADE INDICATORS (million dollars)

Manufacturers' Sales			Manufacturers' Inventories		
Latest Month	Preceding Month	Year Ago	Latest Month	Preceding Month	Year Ago
30,800	31,580	29,130	54,320	53,900	50,450
2,300	2,380	1,980	4,060	4,050	3,700
3,110	3,130	3,050	3,340	3,400	3,320
1,050	1,070	990	1,540	1,540	1,460
1,210	1,260	1,200	2,640	2,650	2,460

CHEMICAL CUSTOMERS CLOSE-UP





Now you see it.....now.....you don't

Want to see a tablet dissolve fast? Bind it with **CAB-O-SIL®**... drop it in a glass of water...and get out of the way

We may be exaggerating, just slightly. But what we want to get across is that just a pinch of Cab-o-sil, the new superfine "airborne" silica, works lightning fast as a disintegrating agent.

Promoting instant dissolving action is just one of many ways Cab-o-sil is making itself useful in pharmaceuticals today. Its versatility as an inert is absolutely unprecedented. Not only is it already playing all the roles listed below — but often it performs two, three, or more of them simultaneously.

Cab-o-sil's unique versatility stems from an absolutely unique combination of properties, including enormous external surface area (200 m² gm), excellent hydrophilic characteristics, chemical inertness, exceptional purity

(99.7%), and extremely fine particle size (11.1 million billion particles per gram).

The question can be put this way: why use ten or a dozen different agents... when you can use a single pinch of Cab-o-sil instead?

We invite you to send for a free sample and discover for yourself what it can do.

Cab-o-sil can be used in all these ways:

■ inert substrate or carrier ■ binding agent ■ thixotropic agent ■ dry grinding agent ■ thickening agent ■ dispersing agent ■ gelling agent ■ buffering agent ■ insulating agent ■ free-flow agent ■ reinforcing agent ■ tabletting agent



Minerals & Chemicals Div., CW

GODFREY L. CABOT, INC.

125 High Street, Boston 10, Mass.

USES:

- Thixotropic, thickening, gelling agent — lubricating oils, greases, polyester resins, epoxy resins, plastisols, plastigels, organosols
- Sustaining agent — paints
- Flatting agent — varnishes, lacquers, organosols, plastisols
- Reinforcing agent — rubber, silicone, latex film
- Anticaking agent — sulfur, insecticides
- Antislip agent — solvent-base floor waxes
- Precoating material — reproduction paper
- Low temperature thermal insulation
- Pharmaceuticals and Cosmetics — (See bulletin #cpha-1)

Please send copy of bulletin #cpha-1 (Cab-o-sil in Pharmaceuticals and Cosmetics)
 free Cab-o-sil sample and other technical data checked

Technical data available:

- () General Properties, Functions and Uses (#cgen-1)
- () Cab-o-sil in the Rubber Industry (#crub-1)
- () Cab-o-sil in Butyl Rubber (#crub-2)
- () Cab-o-sil in Dipped Latex Films (#scrub-3)
- () Cab-o-sil in the Lubricating Grease Industry (#cgre-2)
- () Aqueous Dispersions of Cab-o-sil (#cmis-2)
- () A Flatting Agent for Varnishes (#cpai-3)
- () Cab-o-sil in the Reproduction Paper Industry (#cpap-1)
- () Cab-o-sil in the Plastics Industry (#cpa-2)
- () Cab-o-sil in Automobile Polishes (#cpol-1)



Photographed with the cooperation of Mohawk Carpet Mills, Amsterdam, N. Y.

No slip showing

Modern latex backing keeps rugs attractively and economically planted. And TITANOX® white titanium dioxide pigments in the latex, put more appeal in the showroom.

Out front or quietly in the background, TITANOX white pigments give latex products that *extra* appeal that makes the difference. For the clean, bright backing of today's rugs and carpets is a far cry from the drab, dark backing of the past. It helps keep sales figures firmly planted on an upward path.

There are one or more types of TITANOX white pigment—rutile and anatase titanium dioxides, and also titanium-calcium—not only for latex coatings, but for everything that needs white pigment... paint, paper, rubber, plastics, inks, porcelain enamels, textiles and leather to name some. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities. In Canada: Canadian Titanium Pigments Ltd., Montreal.

TITANIUM PIGMENT CORPORATION
SUBSIDIARY OF NATIONAL LEAD COMPANY



